AVIATION WEEK

A McGRAW-HILL PUBLICATION

May 28, 1956 50 cents

Bristol Britannia: Britain's Challenge To U. S. Jet Liners

Bristol Britannia 100

JP-4 Jet Fuel Performs As Favorably as Kerosene

'Cessnarama' Boosts Sales, Promotes Business Flying

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KAYLOCK
TRADE MARK

all-metal self-locking

HEX NUT

REPLACES ALL THREE

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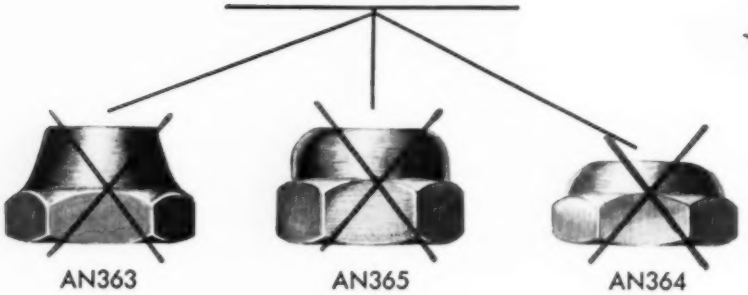

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WEIGHT SAVINGS and SPACE SAVINGS

Shear-nut height with tensile nut strength —and the lightest of all self-locking nuts. 250°-550° F. requirements

Kaylock nuts are precision products produced in full conformance with Air Force-Navy specifications AN-N-5 and AN-N-10. For more information, write for our catalog.

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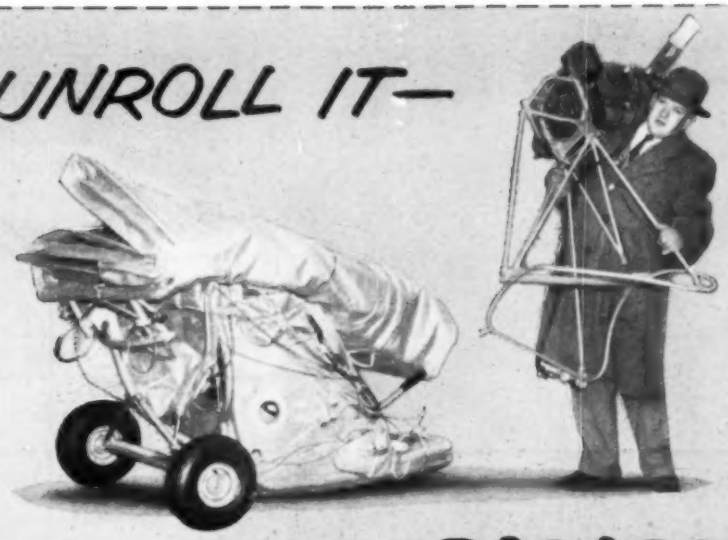
UNROLL IT—



and FLY AWAY!

Probably the closest man has yet come to a Magic Carpet!

For here is an airplane built of inflatable rubberized fabric *—a plane which can be unrolled like a carpet and flown away!*

Developed, designed and built by Goodyear Aircraft in a span of slightly more than 12 weeks' time—it may herald the day when infantrymen may be equipped with their own lightweight, collapsible, portable plane.

The wings, tail assembly and pilot's seat are made of Airmat, a new structural fabric developed by Goodyear, which "makes like a beam"—a double-walled inflatable fabric connected by thousands of inner load-bearing Nylon threads.

As a result, the airplane remains rigid and maintains its configuration when inflated by a compressed-air cylinder to pressures far lower than required by the tires on a family car.

The fuselage employs the same envelope fabric utilized by Goodyear Aircraft in building the Navy's huge lighter-than-air ships.

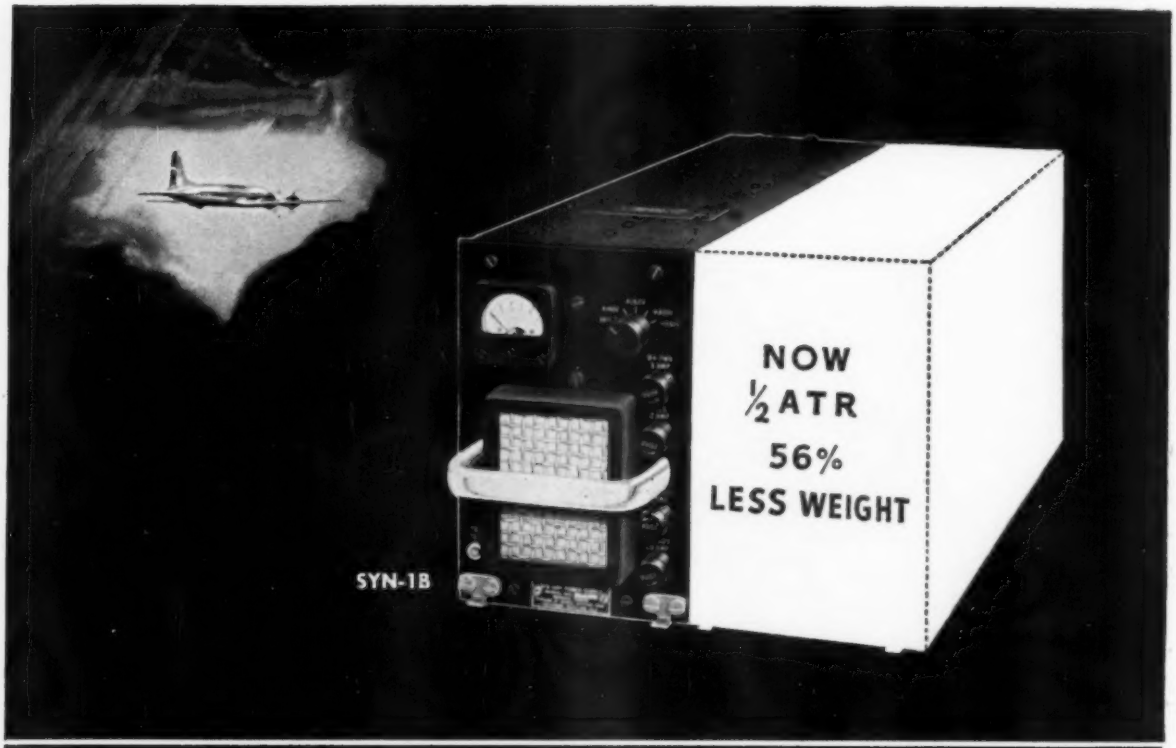
So strong is this true-to-life Magic Carpet, the only tubular struts involved are those needed to form the landing gear and engine supports.

It is another interesting example of the kind of imaginative engineering and skillful use of new materials being constantly demonstrated by Goodyear Aircraft Corporation in forging new frontiers—for air progress and for industry.

They're doing big things at

GOODYEAR AIRCRAFT

Plants in Akron, Ohio, and Litchfield Park, Arizona



ANT-1 Antenna

RDR-1 Transmitter-Receiver

PPI-1 Indicator

CON-1 Control Unit

New . . . Lighter, Smaller Synchronizer For BENDIX Weather Radar System

This new SYN-1B Synchronizer—heart of the Bendix* RDR-1 Weather Radar System—represents the ultimate in lightweight design for this type of equipment. It weighs only 21 pounds—27 pounds less than its larger predecessor. The number of vacuum tubes used has been reduced from 32 to 19.

The SYN-1B Synchronizer is but one of several advancements incorporated in the Bendix RDR-1 Weather Radar System. Four types of antennas are available. Improved contour circuitry in the Transmitter-Receiver unit assures even greater trouble-free operation. All relays are protected against dust particles by easily accessible, removable covers.

Get the full story on Bendix Weather Radar. Find out why it is fast becoming the leader in its field. Contact your local Bendix Aviation Radio Representative. Or write the factory direct. Address below.

* Reg. U. S. Pat. Off.

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West Coast Sales: 10500 Magnolia Blvd., North Hollywood, California
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Canadian Distributor: Aviation Electric, 200 Laurentian Boulevard, Montreal, Quebec

Bendix AVIATION Radio

Bendix AVIATION CORPORATION

AVIATION CALENDAR

May 30-June 3—Eighth Annual Wright Memorial Glider Meet, sponsored by The Soaring Society of Dayton, Dayton.

June 2—Seventh Annual Maintenance & Operations Meeting, Reading Aviation Service, Inc., Reading Municipal Airport, Reading, Pa.

June 3-8—Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 4—National Fire Protection Association Seminar on Jet Speed with Fire Safety, Hotel Statler, Boston, Mass.

June 5-6—Spring Assembly Radio Technical Commission for Aeronautics, Hotel Statler, Boston

June 13—B. F. Goodrich Technical Forum, co-sponsored by Atlantic Aviation Corp. and Airwork Corp., Atlantic Aviation Hangar, Teterboro Airport, Teterboro.

June 17—Second Annual Air Show, sponsored by Post 1920 Veterans of Foreign Wars and Burlington Flying Service, Inc., Municipal Airport, Burlington, N. C.

June 17-21—American Society of Mechanical Engineers, semi-annual meeting, Hotel Statler, Cleveland, Ohio.

June 17-30—Third Annual Material Handling Training Conference, Lake Placid, N. Y.

June 18-21—National summer meeting of the Institute of Aeronautical Sciences, 7660 Beverly Blvd., Los Angeles.

June 19—Council of the International Civil Aviation Organization, 10th session, Caracas, Venezuela.

June 20-22—Aviation Distributors and Manufacturers Assn., 27th meeting, Grove Park Inn, Asheville, N. C.

June 25-27—High Temperature Symposium, Berkeley Campus, University of California.

June 30—Jet Age Conference, Sheraton-Jefferson Hotel, St. Louis, Mo.

July 7-10—Tenth annual All-Woman Transcontinental Air Race (Powder Puff Derby), San Mateo County Airport, Calif. to Flint, Mich. Entries close June 20. For details write: Mrs. Betty M. Loufek, Loufek & London, 2611 E. Spring St., Long Beach 6, Calif.

July 8—Third annual Western New York Air Show and Races, Niagara Falls Municipal Airport, Niagara Falls, N. Y.

AVIATION WEEK • MAY 28, 1956
Vol. 64, No. 22

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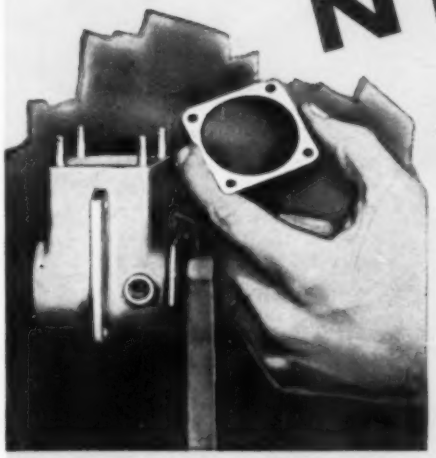

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PLEXIGLAS 55 combines the traditional clarity, formability and resistance to weathering of PLEXIGLAS with notably improved craze-resistance and a higher maximum useful service temperature. For the planes of the future, we are working to raise the quality of transparent plastic to an even higher level.

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Douglas A4D, F4D-2	Sikorsky H-19, HO45, HRS

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Designed by engineers and built by technicians who have worked together for more than a decade, Whittaker Gyros offer unsurpassed performance.

Stainless steel construction (including gimbals), meticulous care, continuous testing of components and assemblies, plus 100% inspection tests of components, have resulted in an overall customer rejection of less than 2% — month after month.

TYPE G110
SLAVED VERTICAL GYRO UNIT
(case removed)

The G110 type vertical gyro is basically a two degree of freedom gimbal system incorporating an alternating or direct current powered rotor and an electrical gravity sensing erection system. The gimbal travel is restricted to a maximum of ±80 degrees on inner and outer gimbals.

The gyro may be furnished with either a hermetically sealed or removable dust-proof cover.

The gyro is depicted with separate glass sealed terminals but can be furnished with any available sealed connector.

The G110 series gyro is available with the following methods of indication:

OUTER GIMBAL	INNER GIMBAL
1. Potentiometer	1. Potentiometer
2. Commutator	2. Commutator
3. Synchro	
4. Resolver	

TYPE R130
RATE GYRO UNIT
(case removed)

The R130 type instrument is basically a single degree of freedom gyro incorporating an alternating or direct current powered rotor, air dash pot damping, and spring restraint.

The gyro may be furnished either hermetically sealed or with a removable dust-proof cover.

The R130 series rate gyro is available with the following methods of indication:

1. Potentiometer
2. Microsyn
3. Commutator
4. Switching Contacts

TYPE G120 **FREE GYRO UNIT** (case removed)

The G120 type free gyro is basically a two degree of freedom gimbal system, incorporating an alternating or direct current powered rotor and a manual or electrical caging system.

The gyro may be furnished with either a hermetically sealed or removable dust-proof cover.

The gyro is depicted with separate glass sealed terminals but can be furnished with any available sealed connector.

The G120 series gyro is available with the following methods of indication:

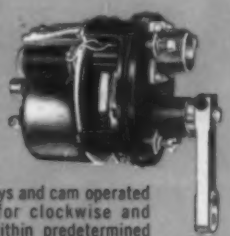
OUTER GIMBAL	INNER GIMBAL
1. Potentiometer	1. Potentiometer
2. Commutator	2. Commutator
3. Switching Contacts	3. Switching Contacts
4. Synchro	
5. Resolver	

TYPE G140
3-AXIS TELEMETERING GYRO
(case removed)

The G140 type gyro consists basically of two, two degree of freedom gimbal systems, incorporating alternating or direct current powered rotors. A direct current powered caging and uncaging system is provided.

The two gyros are mounted in a single frame in such a manner that output indication is obtained about three mutually perpendicular axes.

TYPE S21A
ELECTRIC SERVO
(case removed)



The S21A type servo consists of an output shaft and arm, driven through a gear train by a direct current motor. The torque arm is controlled by a system of relays and cam operated switches, which provide for clockwise and counter-clockwise rotation within predetermined limits and positive location at the center position.

This servo is designed to actuate aircraft control surfaces upon receipt of an external command signal. Electrical connections for motor and command circuits are provided through an AN type receptacle.

Whittaker Gyro

DIVISION OF TELECOMPUTING CORPORATION

VAN NUYS, CALIFORNIA — STANLEY 7-5511

See the new Saw from C-B Tool Company

IT WEIGHS LESS,
COSTS LESS,
WORKS BETTER

The C-B Tool Co. Story

It was easy! Engineers from C-B Tool Company, Lancaster, Pa. and OSTUCO in Shelby worked out a welded steel tubing component to replace a heavy, bulky oil reservoir and to serve as a handle for the new saw. See the difference this makes in the new Lancaster Model 400A chain saw:

- **Saves Cost—$4.25 on each chain saw!**
- **Saves Weight—3 pounds on each unit!**
- **Works better—Saw now has positive, continuous oiling instead of push-button oiling by the operator.**

Perhaps this story from C-B Tool has a message for you.

If you have trouble with see-sawing production costs and quality, OSTUCO may have the answer to your problems. Unique single-source service eliminates interplant shipment, reduces error, gives better production control. See about it . . . see OSTUCO! Contact the Shelby office or your nearby OSTUCO Sales Engineer for details.

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The Sciaky Predetermined Electronic Counter Weld Control is absolutely consistent. Positive adjustment snap switch control dials are calibrated in cycles and impulses. You set the number of cycles and impulses you want and you get them throughout the longest or shortest run—and you can easily reproduce them at any time.

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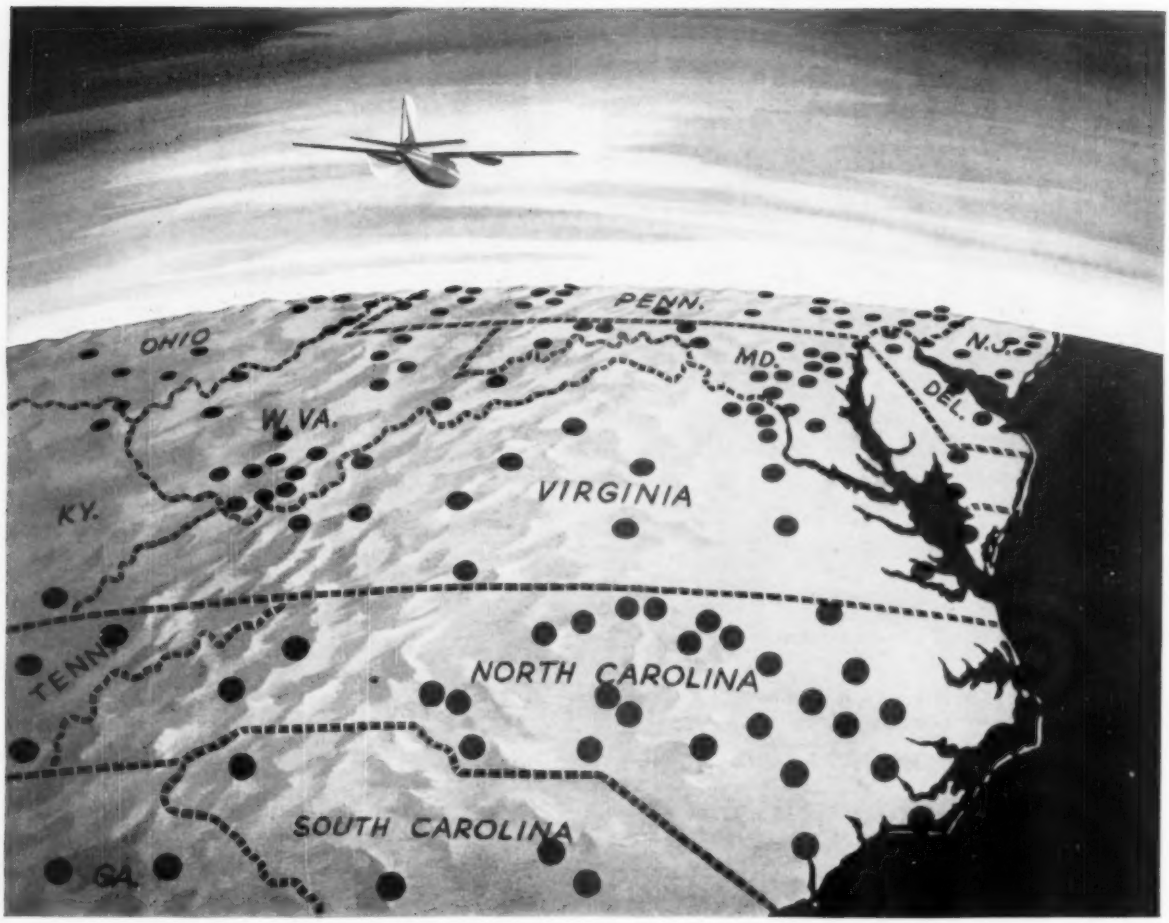

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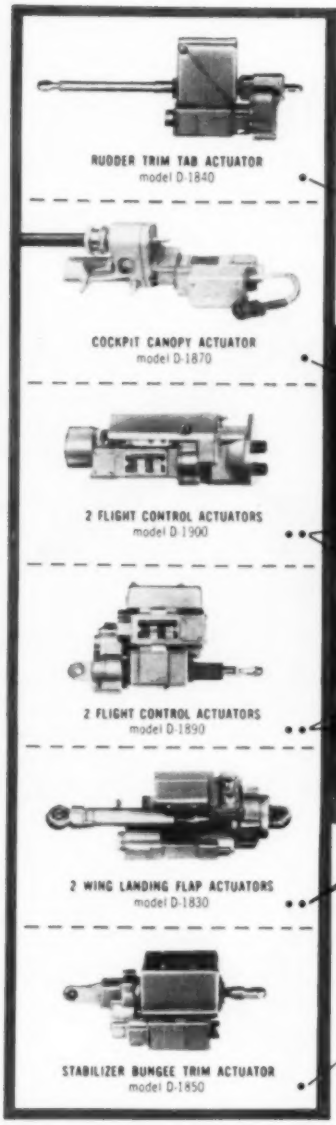
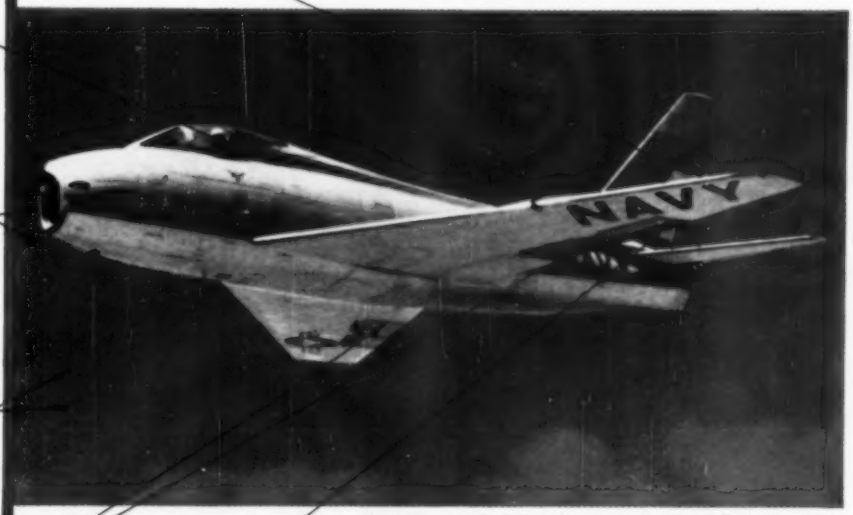
9 HOOVER ACTUATORS

flex the muscles of the Navy's New Fury Jet





North American FJ-4 Fury. Now in production at North American's Columbus, Ohio division for the Navy, this carrier-based, swept-wing jet fighter has a high rate of climb and speed in excess of 690 mph.

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WIRING ASSEMBLIES SEALED FOR ENVIRONMENTAL PROTECTION

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By the combination of plasticizers, stabilizers, pigments and fillers, Scinseal has been formulated to meet the requirements of many adverse conditions.

For example, one usage may require low-temperature flexibility, while another is concerned primarily with a high temperature condition, and still other applications may present fuel and acid problems—or perhaps a combination of all of these characteristics is the desired result.

That is why Scinseal is virtually a miracle material, for it can be "tailored" to meet a wide range of requirements, and at the same time, minimize the weight of the finished product.

Scinseal can be provided in a variety of solid colors, and can be hot stamped to provide positive identification. Many electrical connector adapter molds are available, as well as the T's, Y's and variable molds necessary to provide reliable assemblies of any configuration.

Detailed information and data on Scinseal available on request.

*TRADEMARK

Can be tailored to meet individual needs and purposes

Scinseal is used in such specialized fields as underwater devices, ground radar equipment, missile control wiring.

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK

Bendix
SCINTILLA DIVISION

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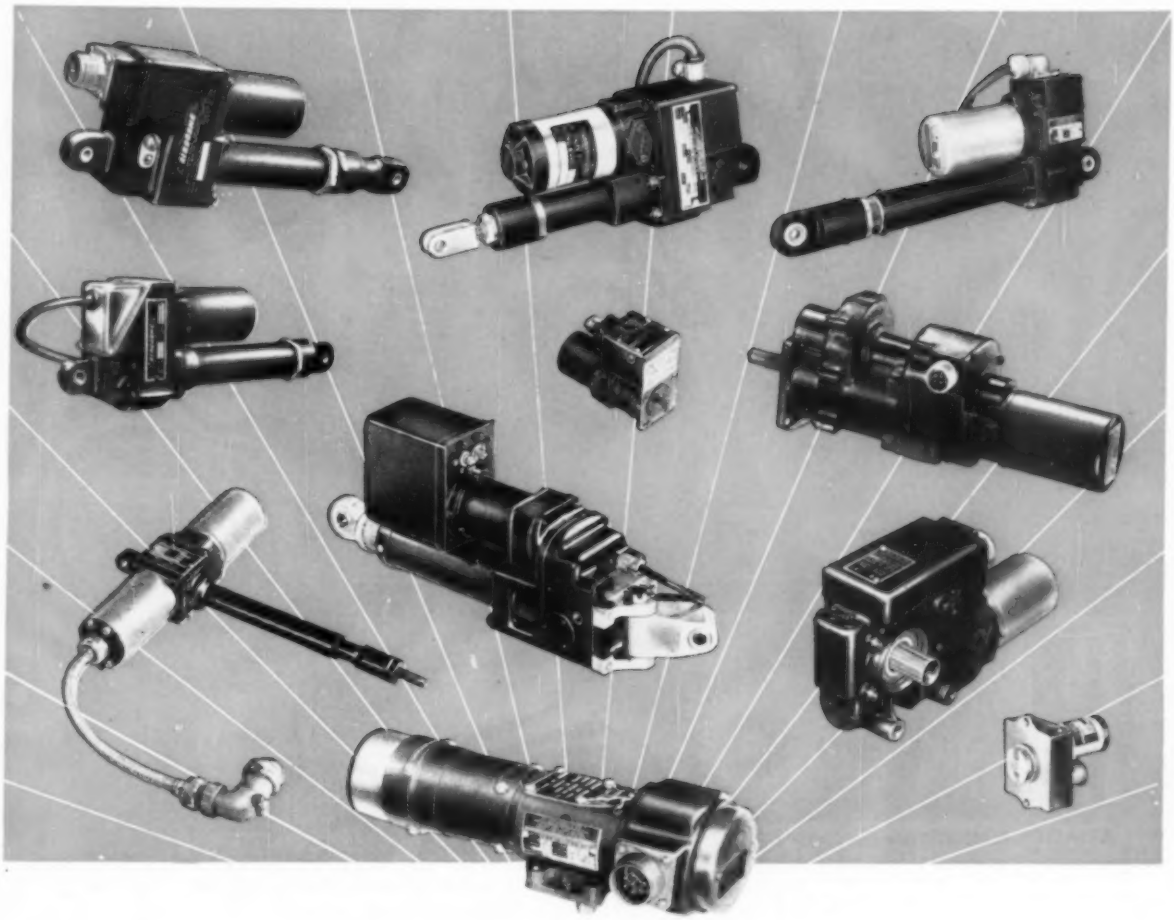

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The actuator you need—be it for ailerons, cowl flaps, a feel system, or any of a hundred other applications—may be a stock item at Airborne. No other manufacturer makes as wide a line of actuators for the aircraft industry.

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Beyond the broad limits of this line, our engineering group can, and does, design special aircraft components or complete systems, including actuators and controls.

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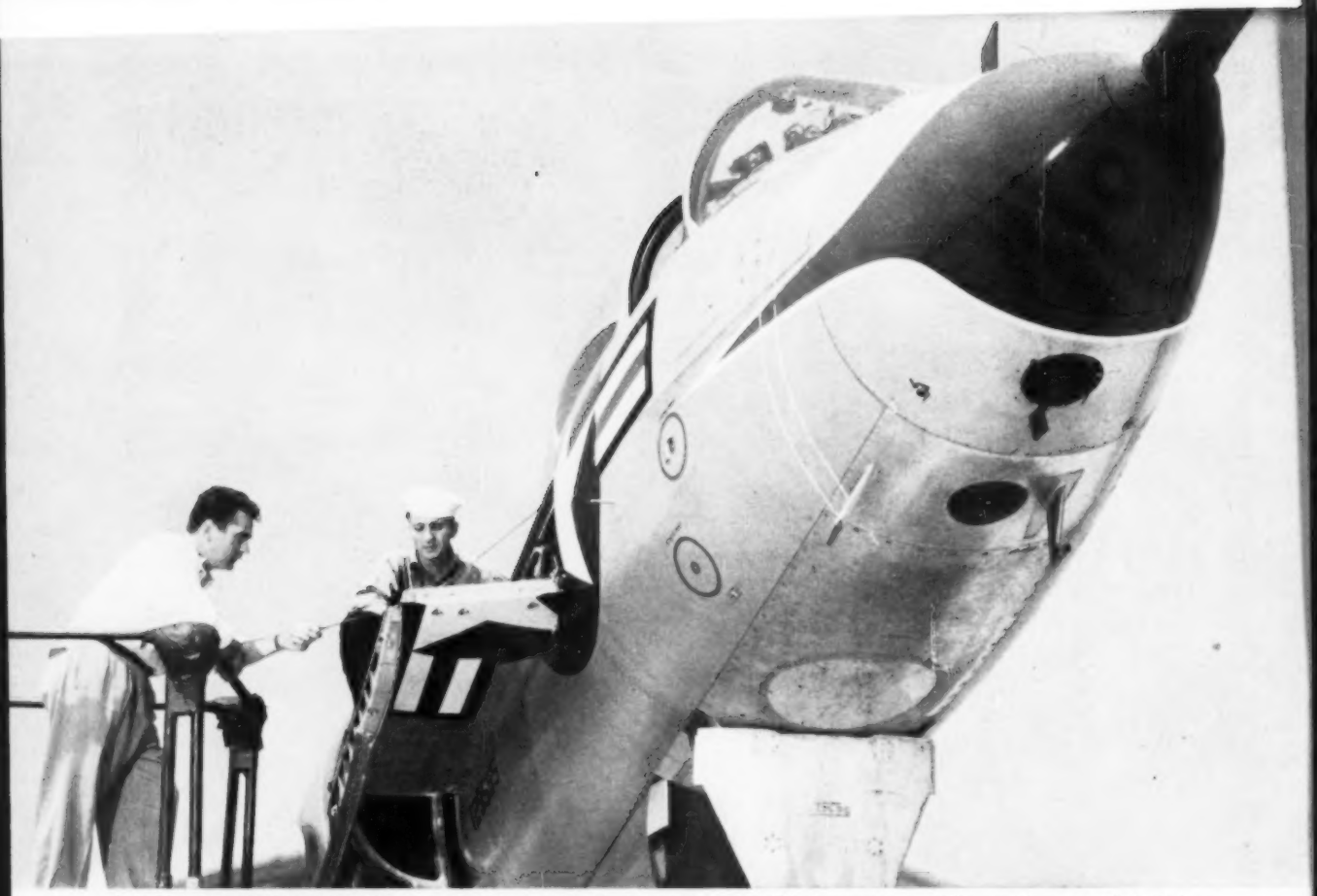

NAVY AVIATION ELECTRICIAN and G-E "tech rep" check out flight stabilization system on Chance Vought F7U-3 Cutlass.

How on-the-spot service engineers back up General Electric flight control systems

G-E SERVICE ENGINEER, Willie Jaques, demonstrates the autopilot line maintenance tester to Navy aviation specialists.

G-E field service engineers provide valuable technical assistance to the Armed Forces wherever service is required on General Electric flight control systems. These "tech reps" also conduct classes for pilots and aviation specialists on the operation and maintenance of G-E flight control systems.

In addition, General Electric service engineers make detailed field operation reports on flight control system performance. These reports provide design engineers with information on system performance on operational aircraft for improving future G-E flight control systems—systems that are now being designed and built for the latest supersonic aircraft.

FOR DETAILED INFORMATION on the flight control systems that General Electric is designing and manufacturing for our Armed Forces, contact your G-E Aviation and Defense Industries Sales Office. Section 221-9, Schenectady 5, New York.

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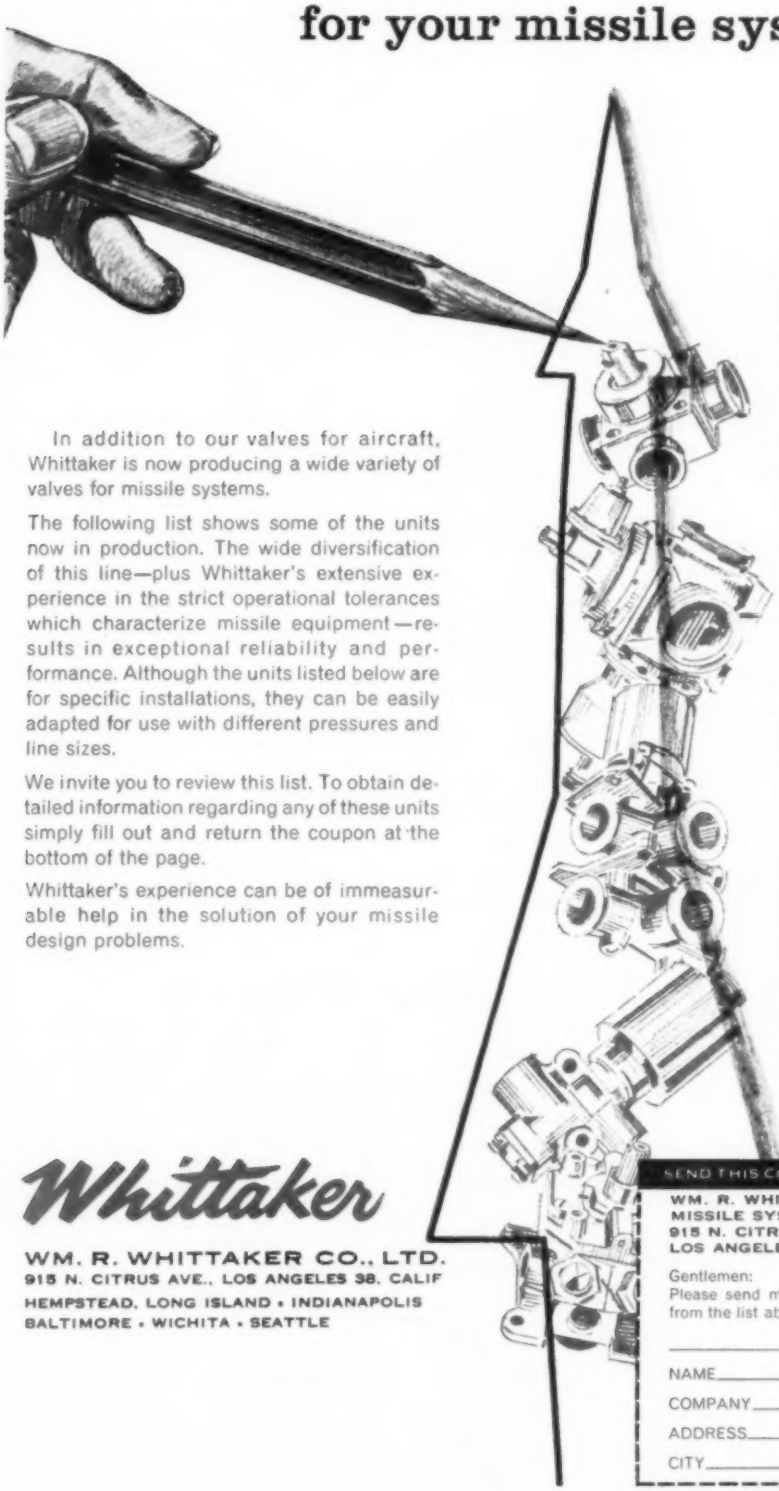

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RESEARCH AND MARKETING

Mary Whitney Fenton, Elinore Eisenson, Joan Read

Services Battle for IRBM Jurisdiction 26
► USAF, Army with eye on operation of IRBM, open struggle with skirmish over smaller missiles.

Canada Adopts New Air Traffic-Control Plan 37
► All aircraft between 9,500 ft. and 23,000 ft. must fly IFR regardless of weather conditions.

Britannia Challenges U. S. Jet Airliners 44
► Sale of Bristol turboprop transport to Capital Airlines for April 1957 delivery would cap invasion attempt.

Cessna Dealer Promotion Paying-Off 100
► Local shows, patterned after those of automobile industry, boost sales and promote business flying.

MISSILE ENGINEERING

Army Demonstrates Nike 28
Chrysler Produces Redstone Missile .. 29
Veronique Aims at 137 Miles 57
Fireflash on Meteor Wingtips 63
Northrop's New Shake Tester 88

AERONAUTICAL ENGINEERING

Supersonic Engine in Lewis Tunnel ... 32
CF-105 Supersonic in Climb 32
Convertawings Start Copter Tests 99

AVIONICS

Automatic Air Traffic Control 65
Panel Ideas for Avionics Progress 71
Filter Center 76
New Avionics Products 77

EQUIPMENT

Kerosene, JP-4 Fuel Tests 84
Piston Actuator Launches Stores 86
Delta Backing Saves Packing Wear .. 88
Pratt & Whitney Offers Jet Muffler .. 91
New Products 93
Also on the Market 94

TRANSPORT

Lobby Charges Hit Non-Skeds 34
Fare Policy Creates IATA Problems .. 38
Adams Predicts Jet Liner Profits 39
Burke, Va., Airport Funds Asked 39
DC-7C Certificated 39
CAB's Stand on New Airlines 39
Airline Revenues and Expenses 40
Mid-Manhattan Helicopter Service ... 41
Senate Urges Re-Equipment Change .. 41
CAB Orders 41
Airlines Report Salaries 43

BUSINESS FLYING

Peak Plane Deliveries in April 101
Modified Lodestar Speed: 260 mph .. 105
Private Lines 111

MANAGEMENT

USSR Will Have Knock-Out in '59 27
Small Business Plea for Equality 31
R&D Secretaries Asked For 33
Who's Where 23
Industry Observer 23
Washington Roundup 25
News Digest 34

Calendar 5
Letters 130

EDITORIAL

Technology Forces New Military Roles .. 21

COVER: Bristol Britannia 100 will go into service on British Overseas Airways Corp. routes to South Africa this summer. Meanwhile, Bristol is attempting to invade the U. S. market with a sale to Capital Airlines. BOAC cooperation in accepting a delivery delay could enable Bristol to deliver Britannias to Capital next April. Bristol's invasion plan is described beginning on p. 94.

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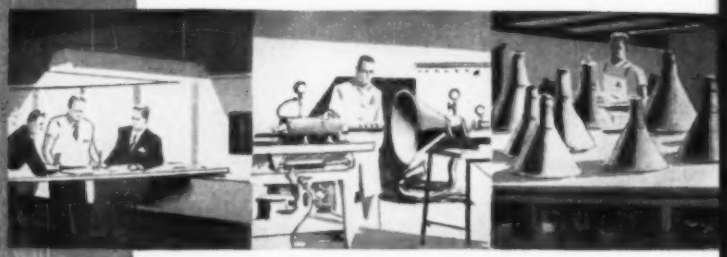

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EDITORIAL

Technology Forces New Military Roles

The current rash of inter-service sniping emanating from the Pentagon, like the revolt of the Navy admirals in 1949, stems from the inexorable impact of new technology on the military problem. President Eisenhower has wisely pointed out that these differences between the services are nothing new and that they are a necessary process in the constant evolution of military policy to fit the new requirements of defense effort.

From the time that gunpowder displaced the armored knight and the longbowman, professional military men have been slow to understand and accept the new technological advances that have inevitably changed the methods and concepts of waging war.

In 1949, a large portion of the Navy high command honestly believed that no aircraft could fly 10,000 miles without refueling, drop a full atomic bomb load at the halfway point and generate sufficient speed and altitude performance in the target area to foil defensive efforts. The performance of the B-36 bomber, which has since proved all of these points in actual flight operations, went far beyond any previous aeronautical experience and proved again how dangerous it can be to interpret the technical future in terms of the past.

Even Admiral Radford, who once termed the B-36 program a "billion dollar blunder," might be willing to concede now that this indictment was based on insufficient understanding of a fast developing technology. In fact, there is evidence to indicate Admiral Radford has come abreast of long-range jet developments, since he has lent strong support to the expanded Air Force B-52 bomber program.

The Air Force was born in a tremendous technological stride and has lived closest to one of the fastest expanding technologies the world has ever seen. Consequently, it is more in tune with the revolutionary developments of the last two decades than its sister services. The Navy has had long experience with a slower moving industrial development but is now fully immersed in the supersonic aircraft, nuclear propulsion and nuclear weapon complex that will certainly create amazing new weapons to maintain control of the seas.

The Army with its tradition of "blood, leather and guts" has been the last of the three services to fully grasp the impact of the new technologies. As a result, it is in the tightest squeeze when roles and missions are assigned on the basis of new weapons produced by technical development, such as guided missiles. The Army has made a tremendous effort to re-orient itself with technology during the regime of Gen. Maxwell Taylor as Chief of Staff, but it is clear that it still has a long way to go before it can compete in technical development with the other services.

Among its serious handicaps are the lack of opportunity for advanced technical training of its officer personnel and its adherence to the ordnance arsenal type of operation for new weapons development. The Navy and Air Force, on the other hand, have long since established a firm industry partnership as the basis for their technical progress.

The impact of technology on military organizations inevitably produces both inter- and intra-service battles between the conservatives who blindly cling to tradition and the radicals who wish to plunge boldly ahead.

Even in the Air Force, the newest and most technically sophisticated of the services, this conflict between the "bomber general" and the missile men is seething and will produce its share of public eruptions before it is finally resolved. Similarly, the flying admirals of the "tan shoe" Navy who fought their more conservative leaders of the "black shoe" battleship contingent two decades ago are now in the conservative wing battling the assaults of the nuclear submariners and guided missile men.

It is evident that the extremely rapid pace of technical development in the post-war era that already has pushed weapons into the fringe of outer space, given them intercontinental ranges and area-obliterating capabilities, must produce profound changes in military organizational, strategic and operational concepts if they are to be effectively utilized. The Defense Department is just beginning to feel the first slight tremors of this technological earthquake in the foundations of its traditionalism.

The old concept of dividing military forces by the elements of land, sea and air has been rendered meaningless by the tremendous forces unleashed by the atom, turbojet and rocket. It is obvious that military evolution already is moving in the direction of a more functional service organization tailored to meet a broad military problem rather than control a specific element. The prototype of such a functional organization now exists in the Continental Air Defense Command in which Air Force, Navy, Army and Marine units are operating under a single command organized to provide air defense of the North American continent. Perhaps what eventually will supercede the Army, Navy, Air Force and Marine Corps will be four functional types of military commands in which elements of land, sea and air will be combined to do the required job. These might be:

- **Striking force** containing all the now-diversified elements of our atomic-weapons striking force such as the long-range supersonic flying boat, attack-type aircraft carriers, long-range bombers, missile-launching submarines and intercontinental missiles.
- **Defense force** utilizing all the defensive elements such as the submarine, surface and aerial radar pickets, land-based radar chains, guided missiles, fighter aircraft aboard carriers, land-based interceptors and guided missiles.
- **Police Force** embodying the basic principle of the Marine Corps but equipped to fight anywhere in fringe wars or occupy troublesome areas using the most modern weapons and aerial mobility.
- **Logistics Force** discharging the supply function for all services by the most modern air, sea and land methods.

It is an extremely healthy sign that our military leaders are pondering and questioning and occasionally arguing with the vigor that comes only from firm conviction on the issues confronting them as a result of technical development. If they were completely unaware of these trends, satisfied with tradition and uninterested in progress there would be real cause for alarm.

—Robert Hotz

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Perry R. Roehm, president, Norden-Ketay Corp., New York, N. Y. He succeeds **Morris F. Ketay**, who retires June 1.

Fritz Bingaman, president, Gremco, Inc., Ft. Worth, Tex.

Dr. Charles R. Burrows, vice president-engineering, as of July 1, Ford Instrument Co., Division of Sperry Rand Corp., Long Island City, N. Y.

Richard L. Fitzpatrick, regional vice president-sales (Dallas), American Airlines. He succeeds **M. D. Miller**, who is retiring. Also: **Charles H. Startup**, sales manager (San Francisco).

Charles L. Holbert, executive vice president, H. K. Porter Company, Inc., Pittsburgh, Pa. He succeeds **C. R. Dobson**, who has retired but will serve as consultant to the company.

Honors and Elections

Sir Roy H. Dobson, managing director of A. V. Roe & Co. Ltd. and **Dr. Hugh L. Dryden**, director of the National Advisory Committee for Aeronautics, have been accorded the honor of honorary fellowship of the Royal Aeronautical Society. The council also awarded the following medals: **Joseph Smith** (posthumously), former chief designer for Vickers-Armstrongs, Ltd., British Gold Medal for Aeronautics; **J. Fenwick**, British Silver Medal for Aeronautics; **Sir William Farren**, technical director of A. V. Roe, the society's gold medal; **Dr. E. S. Moult**, chief engineer of de Havilland Engine Co., Ltd., the society's silver medal; **J. W. Barnes**, the society's bronze medal, and **Grp. Capt. W. K. Stewart**, Wakefield Gold Medal.

Stewart M. Ayton, vice president, Atlantic Aviation Service, Inc., was awarded the Certificate of Appreciation of the Junior Chamber of Commerce of Philadelphia for his contribution to the development of the Jaycee Air Cruise.

Changes

Delton M. Lundberg, West Coast representative-sales division, Martin Co., Baltimore, Md.

Francis J. Roach, general manager, Independent Military Air Transport Assn., Washington, D. C.

E. R. R. (Ted) Field, manager-flight operations, and **Capt. B. A. Rawson**, director flight development, Canadian Pacific Airlines, Vancouver, B. C.

George W. Lober, sales manager, newly organized Microwave Electronics Division, Sperry Gyroscope Co., Great Neck, N. Y.

H. S. Peterson, chief engineer, East Coast Aeronautics, Inc., Pelham Manor, N. Y.

William M. Robertson, property management assistant, Riddle Airlines.

INDUSTRY OBSERVER

► McDonnell Aircraft Corp. plans a variety of modifications to production versions of its F-101 Voodoo long-range interceptor. Material for several non-structural areas which separated in high-speed flight will be strengthened. Leading edge wing extensions will be added to correct severe pitch-up at high speeds. Landing gear also will be modified to prevent tire failures from cutting hydraulic brake lines.

► **USAF is developing horizontal maintenance tooling for use with the Pratt & Whitney J57 turbojet. Hydraulic vertical lift stands used for factory assembly and permanent base overhaul can't be provided for field use necessitating the use of horizontal equipment.**

► Grumman's F-11F Tiger is now being flight tested with a General Electric J79 turbojet replacing the Wright J65. The J79 installation features an air nozzle to control exit flow from the afterburner instead of a mechanical variable position nozzle.

► **Douglas A4D Skyhawk has been flight tested with both vortex generators and a trio of wing fences to improve aerodynamic characteristics. Production versions of the lightweight atomic bomber are taking on additional gross weight due to new equipment added by Navy requirements.**

► Convair will use the General Electric J79 turbojet on all versions of its B-58 Hustler supersonic bomber because of earlier engine availability than first anticipated. Original plans called for P&W J57s to power the first 20 B-58s.

► **Convair has sold a Model 440 Metropolitan to the Glenn L. Martin Co. as an executive transport and is negotiating for another 440 sale to the Brooklyn Dodgers baseball club. Convair now plans to extend the basic 440 production line into the first quarter of 1958.**

► Army is evaluating the Cessna T-37 to determine its suitability as a modern observation plane. Army wants speed for quick penetration of enemy-controlled territory, endurance for on-target observation and simplicity of maintenance for front line field operations.

► **Pratt & Whitney Aircraft has delivered its first two J75 15,000-lb.-thrust turbojets to Republic Aviation Corp. for its F-105 and to North American Aviation, Inc. for its F-107 fighter-bomber version of the basic F-100 design. Convair also is scheduled to get the J75 soon for its F-102B all-weather interceptor.**

► First Japanese-assembled F-86F will fly this fall. The Sabres are being assembled by Mitsubishi Heavy Industries, Reorganized, Ltd., under license from North American Aviation. Early this year, a Lockheed T-33 assembled by Kawasaki Aircraft was flown in Japan. Both aircraft are being supplied to the Japan Air Self-Defense Force.

► **Australia wants to manufacture the Lockheed F-104A for its own and the Royal New Zealand Air Forces. The manufacturer probably would be the Commonwealth Aircraft Corp., which has been building Rolls-Royce Avon-powered F-86 Sabres for the Royal Australian Air Force. An Australian version of the Starfighter might be built around a British engine.**

► Beech is testing a new type of cross-wind landing gear in which only one wheel casters. The system is installed on a Super 18.

► **Boeing's 707 jet transport will be capable of descending at 15,000 fpm. with landing gear and spoilers extended. In a decompression or other emergency, descent from a maximum cruising altitude of 40,000 ft. to 10,000 ft. would require only two minutes.**

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Washington Roundup

New Navy Secretary for Air

Garrison Norton, World War II Navy captain and a former Assistant Secretary of State, will soon step in as Assistant Secretary of the Navy for Air, succeeding the incumbent James H. Smith. Although Smith has not yet officially announced his resignation or the reasons behind it, Norton already is in the Pentagon understudying the post. His present job is with the Office of the Assistant Air Force Secretary for Research and Development.

Red Light for Lowen, Minetti

Early Senate confirmation was expected last week of Charles J. Lowen as administrator of the Civil Aeronautics Administration and G. Joseph Minetti as a Civil Aeronautics Board member. The nominations of both Minetti and Lowen were favorably reported out of the Senate Commerce Committee at mid-week: Minetti's nomination was unanimous, but a minority report on Lowen was filed by South Carolina Sen. Thomas A. Wofford, who presumably was miffed over the CAA's policy of denying federal aid to sections of airport terminal buildings with segregated facilities.

More Trouble for OSI

The House Information Subcommittee, headed by Rep. John E. Moss (D.-Calif.), will challenge the Office of Strategic Information's assertion that it has authority to establish policy for other executive agencies on the release of non-classified, but "strategic," information (AW Apr. 30, p. 29). Commerce Department, of which OSI is a part, issued orders setting up OSI "pursuant to a directive of the National Security Council." Moss committee has now managed to get NSC to declassify specific language of the part of its directive dealing with OSI. This language makes it clear that OSI is supposed to give guidance to other agencies, but does not have authority to make policy. OSI Director Erwin Seago and other Commerce officials will be called to testify again on June 8.

U. S.-France Bilateral

The United States and France reopened discussions last week in Paris on capacity provisions in the bilateral air agreement between the two countries. Main bone of contention is the interpretation of the agreement on Fifth-Freedom rights for Pan American between Paris and Istanbul. The French are reluctant to let Pan American carry passengers from Paris to Turkey; the American view is that the airline should be able to pick up through passengers stopping in Paris, as well as local traffic, bound for Istanbul.

Symington Lag

Public release of testimony given by military witnesses before the Symington Airpower Investigating Committee is now lagging behind by almost 30 days due to the problem of getting military security clearance from the Pentagon. Few military security stumbling blocks have been encountered in clearing testimony, but the small staff available to Admiral Arthur Davis, specially appointed Pentagon censor, is slowing the process. Committee members credit Admiral Davis with doing an able job on the mass of testimony. The committee probably will continue hearings through most of June with Defense Secretary Charles E. Wilson as the final witness.

Pan American Cracks Iron Curtain

Pan American World Airways is getting ready to crack the Iron Curtain. The airline has been invited by the Soviet Embassy to come to Russia and discuss landing rights at Moscow and Leningrad. On this end, the State Department apparently has cleared the way, stating that it has no objections to the discussions. Any permit granted to Pan American, however, is subject to review by the U. S. government. No reciprocal rights for Aeroflot, the Russian airline, will be involved in the discussion.

Pan American is likely to send a large delegation to Moscow, and the airline reportedly already has put in a request for visas. If Pan American makes a deal with the Russians, it will be the first American airline to fly across the Iron Curtain to Moscow. The airline received U. S. rights to operate to Leningrad and Moscow when it bought American Overseas Airlines in 1950. Service can be started on the route with relative ease, since the airline already operates as far east as Helsinki.

Army Aviation Interests

Army Aviation Division is interested in research and development projects for a new small transport aircraft that can operate in and out of small and unprepared fields, a new-type observation plane, small turboprop engines; a variety of approaches to the convertiplane including shrouded propellers and deflected slip stream; lightweight aircraft instruments; airborne television cameras, radios and infra-red detection equipment, and new types of landing gear.

Airmail Postage Outlook

Postmaster General Arthur Summerfield's plan to boost domestic airmail postage from three to four cents an ounce—and yield $16 million in additional annual revenue—passed the first hurdle when it was approved by the House Post Office Committee. The legislation faces a major block in the Senate. Sen. Olin D. Johnston (D.-S. C.) has firmly resisted the increases and, instead, has called for economies to reduce the department's deficit.

Profits' Report Due

The House Armed Services Investigating Committee, which completed lengthy hearings on the profits of 15 airframe manufacturers earlier this spring, plans to issue its final report and recommendations in "about three weeks." Hearings of the committee containing data developed during the public hearings and reports filed by the airframe companies should be available in approximately two weeks.

—Washington staff

Services Battle for IRBM Jurisdiction

USAF, Army, with eye on operation of IRBM, open struggle with skirmish over smaller missiles.

By Robert Hotz

Washington—A major jurisdictional dispute over eventual control of the intermediate-range ballistic missiles among the military services was foreshadowed in the Pentagon and on Capitol Hill last week by bitter skirmishing between the Air Force and Army over development and control of anti-aircraft missiles.

Immediately at issue was the USAF's announced determination to procure and install an advanced long-range version of the Navy Talos missile for defense of four Strategic Air Command bases in the United States rather than the Army's advanced version of the Nike.

But looming in the background was the unanswered question of which service will operate the intermediate-range ballistic missiles now being developed by USAF, Navy and Army.

Public Flare-Up

First priority in the IRBM field has been assigned by the Defense Department to the USAF Thor program with the Douglas Aircraft Co. as weapon system manager. The Defense Department also has authorized a back-up IRBM program to develop the Jupiter C missile by a joint Army-Navy group with primary responsibility assigned the Army's Redstone Arsenal.

Defense Secretary Charles E. Wilson last week confirmed that it has not yet been determined which service will actually operate the IRBM in the field and that the service picked to operate any particular missile would not necessarily be the same service that developed it.

Pentagon observers predicted that the controversy over operational responsibility for the Thor and Jupiter C missiles will dwarf the current anti-aircraft missile row both in bitterness and significance.

Also involved in the current inter-service row that broke into the open last week after smouldering in congressional committee hearings since the Fiscal 1957 Defense Department budget was presented in January was the question of the potency of the Navy's aircraft carriers in strategic air war and the role of the Army in atomic warfare.

The spark that fanned the smouldering inter-service rows into a public blaze was the planting of a series of partisan service staff studies with a few Washington newspapermen by a pair of Army colonels. The Army-sponsored leak followed a familiar pattern of inter-service warfare established in 1949 when a document prepared by a Navy civilian was circulated in Congress to begin the B-36 investigation.

Army Plant

The Army and USAF staff studies planted by the Army colonels bitterly assailed the neglect of the Army in current defense planning, devalued the role of aircraft carriers in modern warfare and charged that the Nike missile was a multi-billion dollar military boondoggle. The colonels apparently were willing to release the Air Force paper and its indictment of the Nike to show just how far the inter-service fight had gone.

Publication of these unofficially "leaked" documents stimulated Defense Secretary Wilson to call an extraordinary press conference in the Pentagon at which all the Joint Chiefs of Staff and the civilian secretaries of each service were present. The Wilson press conference was planned to discount the extent of inter-service rivalry but actually served to detail many of the facets of these conflicts. Among the highlights:

- **USAF Secretary Donald Quarles** affirmed the Air Force intention to proceed with further installations of the advanced version of the Talos missile if initial experience at SAC bases is satisfactory. The Talos is a ramjet-powered missile originally developed by the Navy for shipboard use but since adapted to land use for the Marines and USAF.
- **USAF Chief of Staff** Gen. Nathan F. Twining challenged the Army's claim of an air-defense role, stating that the Joint Chiefs of Staff had assigned the air defense of the United States to the USAF and that the Army had only a limited anti-aircraft mission as part of the USAF's over-all responsibility. He said that beyond this limited Army anti-aircraft range, the USAF had responsibility for all air defense including both manned and unmanned interceptors. Gen. Twining indicated that the Nike fell within the Army's mission responsibility but that the Talos and other longer-ranging weapons did not. In addition to the Talos, the Air Force is developing the Boeing M-99 Bomarc pilotless interceptor with a range of about 250 miles.
- **Adm. Arleigh Burke**, Chief of Naval Operations, said the Navy's mission is

"WILSON'S united Pentagon front" at news conference: Gen. Nathan Twining, USAF Chief of Staff; USAF Secretary Donald Quarles; Army Chief of Staff Gen. Maxwell Taylor; Army Undersecretary Charles Finucane; Secretary of Defense Charles E. Wilson; Adm. Arthur Radford, Chairman of the Joint Chiefs; Navy Secretary Charles Thomas; Adm. Arleigh Burke, Chief of Naval Operations, and Marine Commandant Gen. Randolph Pate.

control of the sea and that naval airpower would have to be employed against targets that threatened this mission. Admiral Burke's statement indicated that he was not pushing the Navy's carrier-based aviation as a competitor of the USAF for the strategic bombing role.

• **Defense Secretary Wilson** said the joint chiefs had agreed that successful development of a new missile by a specific service will not necessarily insure that the particular service will operate it in the field. He said the considerations of a service's mission, its training and logistics capacity will determine whether it will be assigned field use of any new missile.

Nike Center of Debate

Center of the current missile controversy is the Army's Nike developed by Western Electric and Douglas Aircraft. The USAF staff study planted by the Army colonels stated the following main objections to this weapon:

• **Nike I range** is so limited (about 25 miles) that it could barely reach 600 mph. bombers at 50,000 ft. before they released their bombs on the target Nikes are supposed to defend.

• **Nike I will not be able** to touch bombers using air-to-ground guided missiles such as the Bell Rascal which can be released toward the target from more than 50 miles away.

• **Nike B**, the advanced development of the missile, cannot effectively utilize all of the fixed Nike bases already built throughout the United States. The Air Force says an entirely new launching system will be required to accommodate Nike B. USAF also says Western Electric has recommended to the Army that the Nike system be switched from a command type of guidance to a target-seeker system.

Nike or Talos?

Although both Gen. Twining and Secretary Quarles disavowed the quoted staff study as an official USAF position, they indicated that the Nike had little attraction for any future USAF planning.

Quarles said:

"The Nike I is an effective weapon, particularly at the time it was selected for production. We hope that if we have to carry an attack that our enemy does not have a weapon like the Nike. However, we need the most advanced weapon to defend our Strategic Air Command bases, and the Nike would not be appropriate for that mission."

Defense Secretary Wilson said K. T. Keller, former Pentagon missile coordinator, recommended the Nike in 1953 as the best missile to put into production.

Wilson also said he regarded the expenditures to date for the Nike and its installations as "justified."

Gen. Maxwell Taylor, Army Chief of Staff, stressed the development potential of the Nike system and said the Nike I was a "two-cylinder type of weapon" as compared with the "four and six cylinder" types under development.

Lieut. Gen. James M. Gavin, Army research and development chief, later challenged USAF contentions on the Nike-Talos comparison during testimony before the Senate Investigating Committee headed by Sen. Stuart Symington (D.-Mo.). Gen. Gavin said the Nike B is the best weapon in existence for its purpose of surface-to-air land-based guided missile defense and averred that the Talos was a "splendid weapon" for its original purpose to serve the Navy at sea.

Gavin said an evaluation of Talos and Nike was now being made by the Weapons System Evaluation Group in the Pentagon.

Senate demands for a comparative test program of Talos and Nike to determine which is the better weapon were parried by Wilson who said he did not see how such tests would serve any useful purpose.

While the missile controversy raged in the Pentagon, the Symington investigating committee indicated it would broaden its original scope to include the role of naval aviation and the roles and missions of the three services as they applied to aviation and guided missiles.

USSR Will Have Knock-Out Punch in '59

By Katherine Johnsen

Washington—Russia will have the strategic air capability within three years to deliver a knock-out blow which would "destroy" the U. S., Gen. Curtis E. LeMay, commander of the Strategic Air Command, testified before the Senate Air Power Investigating Subcommittee.

Subcommittee head Sen. Stuart Symington (D.-Mo.) asked Gen. LeMay during his appearance before the group:

"At what time, if the present programs go along, ours vis-a-vis the Communists . . . do you think they will be in a position, if they hit us, to destroy us?"

Gen. LeMay replied:

". . . You noticed on the war-gaming staff exercise we gave you what happened in 1960 with a surprise attack: We lost definitely.

SAC Losing Force

". . . Now the problem is to back off to where you think the same thing will happen . . . in 1958, we would probably be equal. So somewhere between those two, possibly, is the answer, say 1959."

The general declared that "there is grave doubt that SAC would present an effective deterrence" in the 1958-60 period. On request, he is submitting his estimates to the subcommittee as to what the requirements are to maintain SAC as an effective "deterrent" force through 1960.

Gen. LeMay's testimony was given in executive sessions and released last week after being reviewed for security by the Pentagon. Previously, Gen. LeMay had testified in open session (AW May 7, p. 28).

In the just-released testimony, Gen. LeMay warned of reliance on defensive forces, declaring that "a bomber force, well-equipped, will penetrate any defense system that can be devised." In the U. S., he protested, "nothing much has been done in the way of research on penetration systems—so our problem is to try to get something done.

Technique Advances

"We are always short of research and development money," he continued. "The tendency is to put it on the most difficult problem, which is defense. . . . We must make sure enough research-and-development money is spent on penetration problems to stay somewhere in the same ball park."

Points Gen. LeMay made on the differences between World War II and

Bear Potential

Washington—Gen. John McConnell, director of plans for the Strategic Air Command, reports this potential for the Russian Bear turboprop bomber with a 10,000-lb. bomb load:

• With one refueling, the Bear can fly from the Chukotski Peninsula "clear across the U. S."

• From the Kola Peninsula, one refueling will allow it to "cover all the U. S. and Central America and return to Moscow."

• Without refueling, the plane can fly from the Kola Peninsula "half across the U. S." From Moscow, it "just barely touches the U. S."

present bombing strategy were:

• **In World War II,** bombing missions passed through air defenses directly to targets. But, because of the development of defense techniques, in the future part of the mission would have to be diverted to drop bombs on defensive installations—communications systems, fighter fields, radar sites, etc.

• The capability of strategic forces to meet defensive challenges have kept pace with development of defensive forces.

"The facts are that defense systems are becoming more and more sophisticated," Gen LeMay reported, "but the very same principles of physics that are applied to the defense systems can be applied by offensive systems."

Because of high-yield weapons, he pointed out, "today we can send one aircraft to do a job that we used to send a hundred to do . . . and the smaller the force, the harder it is for the defense system to detect it." SAC's electronic countermeasures, he told the subcommittee, include attack warning equipment and equipment that can "put false targets on ground radar."

"The best thing Air Defense Command can do for SAC is to provide warning time," Gen. LeMay stressed.

"It does not make any difference whether you shoot down zero % or 30% of the bombers coming in. That is not so important. But alert time is. That is the factor that will give us ability to save more of our bombing force."

Gen. LeMay pointed out that it is possible for Russian submarines to come into the Gulf of Mexico and launch missiles from there. By 1960, he said, Russia's turboprop Bear bomber using refueling, "will be able to take off from Russian territory, go clear around the warning line, come in from the Southwest and hit the coast with very little warning."

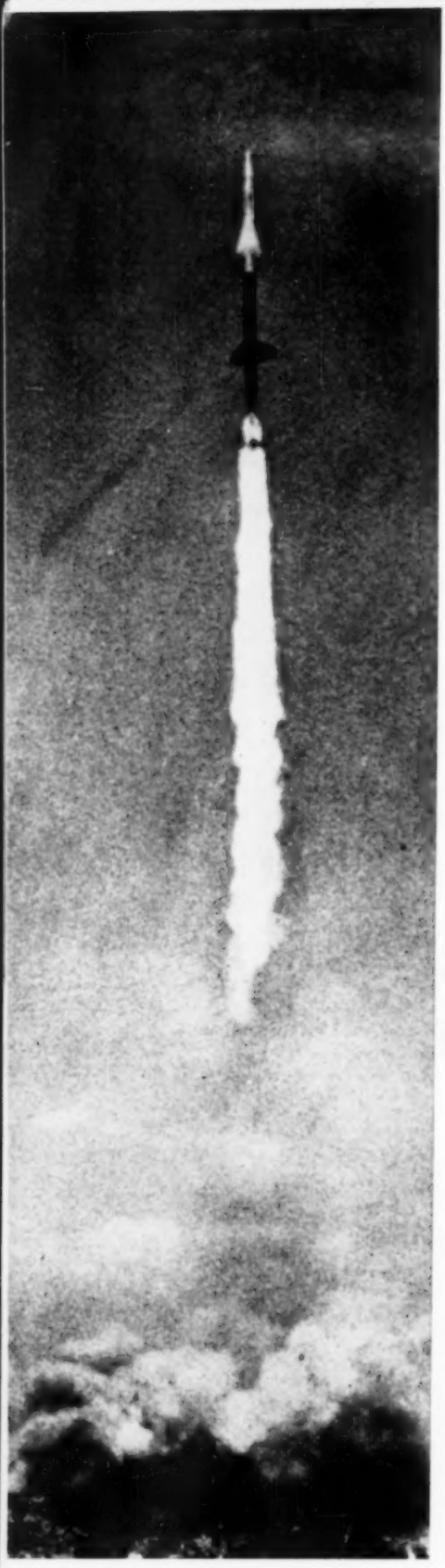
"It is one of the principles of war," Gen. LeMay declared, "that the advantage lies with the offense, and it is even more true, I think, in air warfare than it ever was on the surface."

Other testimony highlights included:

• **Gen. LeMay told** the subcommittee that "there are fewer targets in the U. S. than in Russia because we are forced on to a smaller number of air bases."

• **He concurred** with Sen. James Duff (R.-Pa.) that the accuracy of the intercontinental ballistics missile "will be in very grave doubt for a very long time, and while they could dump them, they would not know where they are going to land." Despite this, Gen. LeMay agreed that the ICBM should have top priority in development.

• **Maj. Gen. John McConnell,** SAC director of plans, reported: At present the U. S. is "way ahead" of Russia in strategic air strength; in 1958, the total bomber capability of the two forces will be approximately the same in long- and medium-range bombers; in 1959, Russia will have "twice" the number of intercontinental Bears and Bisons as the number of B-52s in the USAF.



DUST rolls on ground as Nike missile roars off for strike against Firebee target drone.

Nike Missile Hits Ryan Firebee, But Controversy Is Not Resolved

By David Anderton

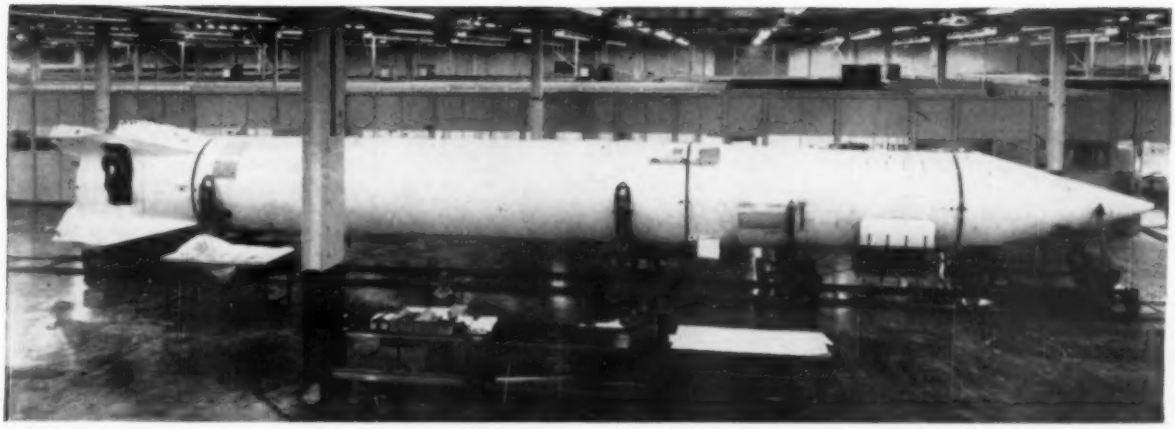
White Sands, N. M.—The Army's controversial Nike anti-aircraft missile demonstrated its capability against current aircraft by a successful strike last week against a Ryan Q-2 Firebee. The target drone was heading toward the launching sites at more than 500 mph. and at an altitude of about four miles. At impact the estimated slant range was more than 20 miles from launching site.

Army officers emphasized that the test was a tough problem because of the small size of the drone and the relatively low altitude of the intercept. No artificial aids were used to improve target acquisition or tracking by the Nike batteries. The entire operation was a routine firing as part of the engineer-user test program which the White Sands Proving Ground conducts on missile systems for the Army Field Forces. The Army in addition to the Nike firings, launched the Corporal surface-to-surface guided missile, and the Honest John, a short-range unguided artillery rocket. Both these weapons and the Nike are operational with the Army.

Army Claims

Success of the Nike strike against the Q-2 still leaves unanswered the controversial question of whether or not the Nike is effective against the Russian operational Bear, Badger and Bison bombers, all with bomb run speeds in the 500 mph. class at altitudes above 50,000 ft. But Army spokesmen said flatly that Nike in its current form could take on any known target, and bombers to 50,000 ft. with no sweat.

Nike has been fired at 600-mph. targets. Presumably the USAF's Matadors and target aircraft have been programmed to take evasive action during the run, the Army added. Operational

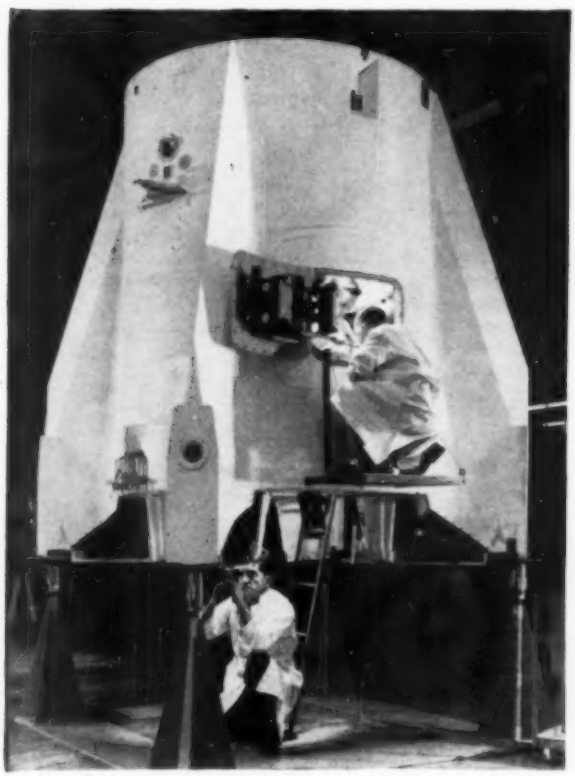


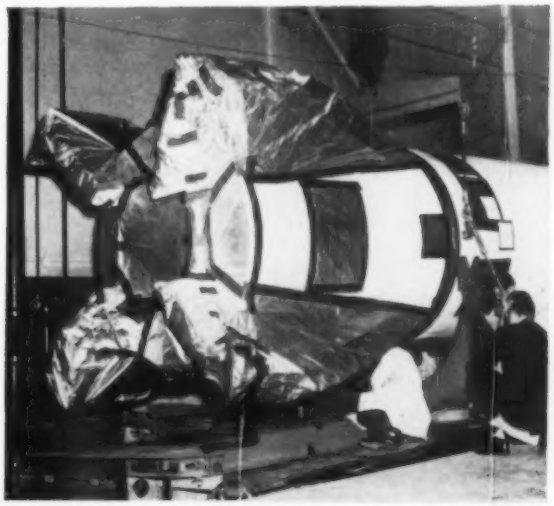
COMPLETED REDSTONE MISSILE rolls off Chrysler production line. After simulated flight test, missile is disassembled for shipment.

Chrysler Produces Redstone Missile For U. S. Army

REDSTONE NOSE is ready for transfer to final assembly line.

TECHNICIAN enters tail cone to complete electrical wiring.

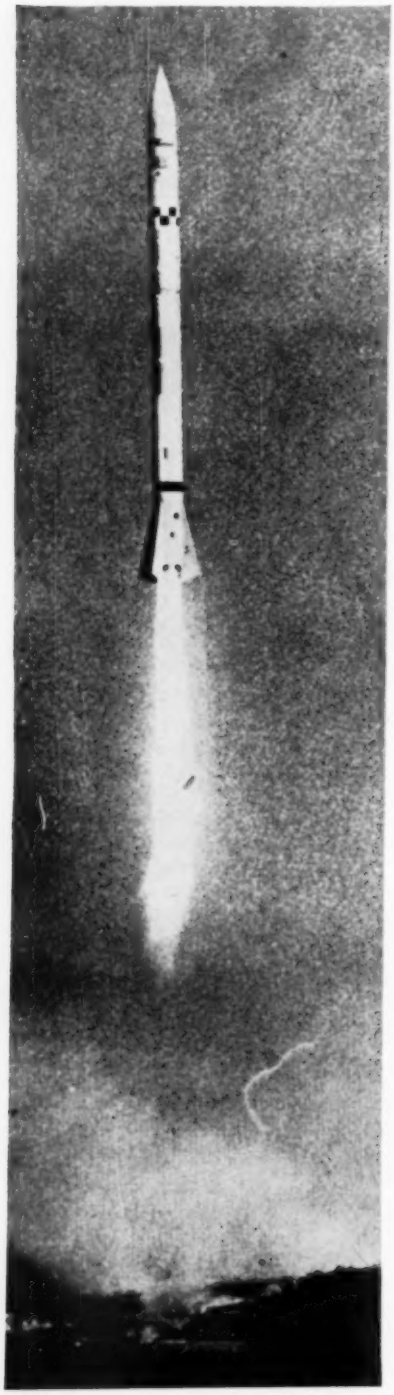




TAIL SECTION vanes and openings are covered for shipment.

reliability of the missile, it claims, is approaching 95%; its kill probability better than one-half, which means that two rounds are needed in practice to guarantee a kill of the target.

During the Nike test, two rounds were fired against the drone. Three batteries—one from the field forces and two from the Proving Ground's Ordnance Mission—were assigned the job of acquiring, tracking the target and destroying it. First battery to acquire the target was to fire first.



CORPORAL surface-to-surface missile, Firestone built, is fired at White Sands.

The drone run was made down-range on a straight course. About 40,000 yds. from the launching site, the action began and a few seconds later a five-second count-down boomed through the speaker systems.

The first Nike roared up off the stand vertically, dropped its booster and began an abrupt turn up-range to intercept the drone. A few seconds after the first firing, a second Nike round took off on a similar flight path.

Underside Hits

Within a few more seconds the first round burst, scoring hits on the belly and underwings of the drone. Right after, the second Nike burst on the predicted flight path of the Q-2 which already was swinging under its recovery chute.

Recovery and analysis of the drone took several hours. The hits indicated the strike would have been decisive against a large aircraft, although the drone itself was not badly damaged. The small size of the drone makes possible a more rugged structure than a full-scale airplane would have. Furthermore, the Nike warhead is fragmentation type, and not a blast; the effect is like a shotgun.

The two Nike rounds fired were Numbers 1650 and 1651 in the Proving Ground program with the anti-aircraft missile.

Most spectacular firing was test launching of the Firestone-built Corporal surface-to-surface missile, one of more than 200 that have been fired here. The Army says Corporal is the world's first guided ballistic missile. Its flight path is compared with a standard, computed for a particular range, and can be corrected along the trajectory even after burnout of the fuel.

Count-down and firing were exactly on schedule. The missile blasted off its launching platform and accelerated upward for about one minute under the power of its acid-aniline fed motor. Total flight time to impact at the target was 225 sec. First radar survey indicated that the Corporal had been right on target.

Two production proof tests were fired on the Honest John artillery rocket in production at Douglas and Emerson Electric. Emerson is a new second source.

Both rounds had been assembled from a random selection of the components that make up the rocket: an MS Jato bottle, canted fins to maintain a slow spin in flight, M7 Jatos to impart initial spin immediately after launching, and a 1,500-lb. warhead.

Honest John range is 30,000 yd. with the 1,500-lb. warhead. The rocket is 27 ft., 3 in. long, 30 in. in diameter at the widest part of the head and 23 in. along the body. Its gross weight is 6,000 lb.

Peak at 30,000 Ft.

Propellant is a single-piece cast charge weighing 2,000 lb. After being launched with the launcher set at 50 deg. of elevation, Honest John reaches the peak altitude of 30,000 ft. in 41 sec. and the impact area 30,000 yd. away in 87 sec.

On a low angle trajectory with launcher elevated 11 deg., peak altitude of 900 ft. is reached in nine seconds and impact at 10,000 yd. in nearly 17 sec.

Rounds fired in last week's demonstration were Numbers 527 and 528 at the Proving Grounds.

Current work load on the integrated range at White Sands is spread over 112 different projects, including such Army missiles as Dart, Hawk and Lacrosse in addition to Nike, Corporal and Honest John.

ARDC to Andrews

Washington—Headquarters for the Air Research and Development Command will be shifted to Andrews AFB, Md., from the present cramped and unduly-dispersed quarters in downtown Baltimore.

In last week's announcement of the planned shift, no specific date was set for the long-debated move to the suburban Washington area, one first predicted by Aviation Week more than two years ago (AW Feb. 22, 1954, p. 12).

Secretary of the Air Force Donald A. Quarles cited as reasons behind the move the requirements for close liaison between the ARDC and the Atomic Energy Commission, the National Advisory Committee on Aeronautics and other technical government agencies.

KLM Buys Hollow Hamilton Propellers

Hollow, aluminum-alloy Hamilton Standard propellers will be used on the 12 Lockheed Electras ordered by KLM Royal Dutch Airlines. Order for the new hydramatic Model/54H60 propellers was announced last week.

The 13½-ft. propellers are equipped with a control assembly which can be removed independently of the propeller. Hydraulic fluid supply is separate from other aircraft systems.

The hollow propellers will be nickel coated. The same propeller model for turboprop transports is available with solid aluminum blades.

Subcommittee Hears Small Business Plea

Los Angeles—A plea for an end to renegotiation, a protest against small businesses having to compete with large firms operating government-furnished facilities and recommendations for progress payments to small businesses on the same basis as they are made to large prime contractors highlighted testimony during a two-day hearing here last week before a subcommittee of the House Small Business Committee.

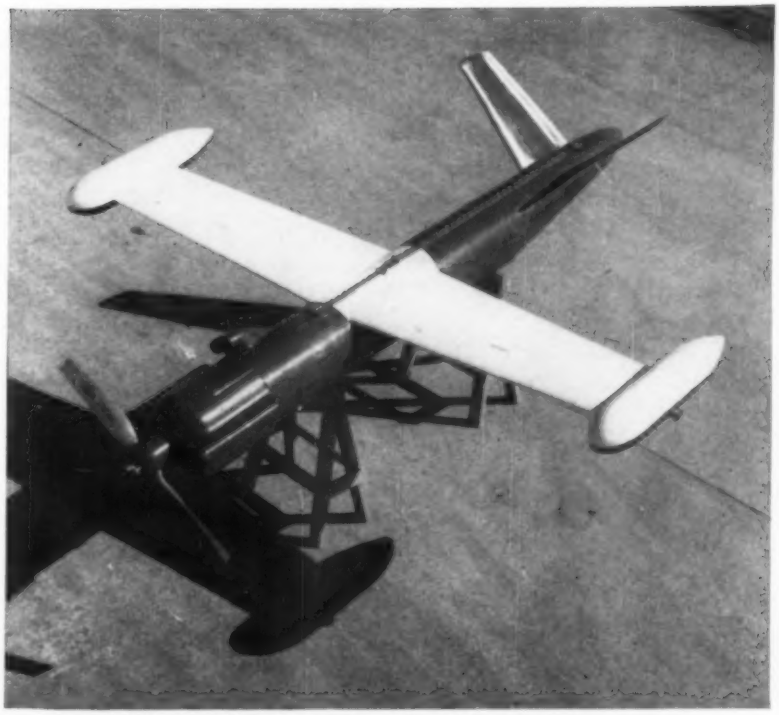
Rep. James Roosevelt (D.-Calif.) and Tom Steed (D.-Okla.) sitting as the subcommittee, heard John Marschalk, Executive Director of the Small Defense Industries Assn., protest that the direct and indirect effects of renegotiation on small business reduced incentives to cut costs and improve production methods. He urged that either the act be repealed or that amendments before Congress be enacted.

Marschalk cited the effect upon a small concern of a large company operating government furnished plants and equipment competing for subcontracts. Small business firms almost automatically have lost out in cases like this, he said.

Brig. Gen. Harley Jones, Deputy Director of Procurement and Production for Air Materiel Command, Wright AFB, Dayton, Ohio, and Rear Adm. John Pearson, General Representative of the Navy Bureau of Aeronautics in the Western District, both testified as to the policies of their respective services in requiring subcontract clauses in contracts with large prime contractors.

Testimony from representatives of prime contractors was given by Rulon Nagely, North American Aviation, Inc., a large USAF aircraft supplier, and Don Bosio, Douglas Aircraft Co., Inc., which does a large proportion of its business with the Navy. Both testified as to policies in subcontracting to small businesses on the basis of competitive bidding on price, delivery dates and other pertinent matters.

The progress payment recommendation was made by C. G. Hokanson, president of a small subcontracting company who testified that to his personal knowledge, six small concerns had gone into bankruptcy during the past year because they could not bear the financial strain of no payments until contracts were completed. He echoed testimony by Marschalk that small businesses do not want subsidy or preferential treatment, but they do want fair consideration when contracts they could fill economically are being considered for letting.



Navy Getting Beech Missile Target

First deliveries will be made in June of Beech Aircraft Corp.'s XKDB-1 target drone to Naval Air Missile Test Center, Pt. Mugu, Calif. NAMTC in July will begin evaluating the vehicle's suitability for surface-to-air and air-to-air armament systems training. Powered by a 120-hp. supercharged McCulloch engine, the XKDB-1 grosses under 600 lb., has a top speed exceeding 320 mph. and can operate at over 30,000 ft. Wingspan is 12 ft. The Navy contract for a test quantity was awarded Beech after a design competition involving nine companies was conducted.

French Interceptor Begins Tests

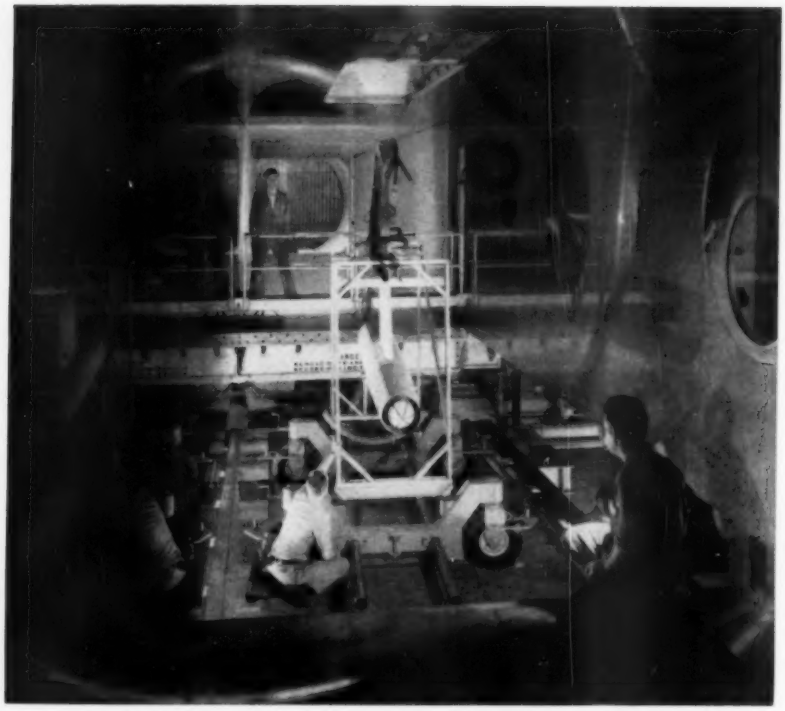
Sud-Est SE-212 Durandel interceptor makes its first flight. A delta-wing configuration, it is powered by a SNECMA Star with afterburner.

Senate Group Restores $8.5 Million to CAA, CAB

The Senate Appropriations Committee last week restored $8.5 million previously taken away by the House from the Civil Aeronautics Administration and Civil Aeronautics Board budgets.

The Senate group gave the CAA the full $40 million it requested to start its five year federal traffic-control plan and increased the $196,118,000 total CAA budget passed by the House to $202,118,000.

The House gave the CAB $15 million for subsidy payment and $4,550,000 for administration. The Senate committee increased the subsidy budget to $17.4 million and added $150,000 to the administrative budget.



RAMJET model being raised into test position by elevator-floor in Lewis tunnel. Note reflections in highly-polished corrosion-resistant steel wall at left.

Supersonic Bomber Engine First Lewis Tunnel Turbojet Project

Cleveland—Lewis Flight Propulsion Laboratory's advanced 10 x 10 ft. test section propulsion tunnel is officially open for business, NACA officials announced last week.

First turbojet project will be a check in mid-June on an inlet-engine system for a future bomber. This will be the first time a high performance aircraft propulsion system has been fully simulated on the ground before flight-test.

Currently the tunnel is being used to evaluate a new high-energy chemical fuel in an NACA "boiler-plate" ramjet. The 10 x 10 tunnel, largest now in operation of the unitary plan tunnels authorized by Congress in 1949, uses 250,000 hp. compressors to simulate up to 148,000 ft. altitude at Mach 3.5 as a closed circuit for aerodynamic testing, or up to 87,000 ft. also at Mach 3.5 as an open circuit for powerplant research.

Exhaust gases from operating propulsion systems would soon contaminate a closed circuit. The test section can handle engines up to 5 ft. in diameter.

For the time being, the lower limits of the facility are almost more significant than the upper limits. The tunnel is unable to test below 50,000 ft. and Mach 2. Though the bomber system referred to has these capabilities, it will be some time before the general state of the art catches up to the Lewis tunnel.

The $32,856,000 spent on the tunnel will be justified in a few years by the certainty that it will eliminate in the future million-dollar engine program failures, asserted Abe Silverstein, associate director of laboratory.

Realistic advance testing in this tunnel will discourage engine manufacturers from trying to squeeze impossible degrees of performance out of limited engines during hazardous and expensive flight-test programs.

The flexible throat of the tunnel is stainless steel, Type 410 stainless, manufactured by the United States Steel Corporation. To eliminate joints, specifications called for the largest stainless steel plates ever to be rolled at the U. S. Steel Homestead Works.

Precise machining was done at the South Charleston, W. Va., Naval Ordnance plant where necessary heat treating, pressing and machine equipment was available.

New Cabinet Proposal

Washington—The creation of a cabinet post to represent both military and civil aviation is being pushed by Sen. Frederick Payne (R.-Me.).

Payne accused the Air Force of going a "little too far afield in not giving proper and due recognition to the requirements of civil aviation." He proposed an Air Secretary who "will be at policy level and can whack the heads of the Defense Department together" whenever the Air Force comes into conflict with civil aviation.

The Senator's suggestion was made during a Senate subcommittee hearing on divorcing the Civil Aeronautics Administration from the Commerce Department, a bill sponsored by A. S. Mike Monroney (D.-Okla.).

CF-105 Supersonic In Climb, Firm Says

Windsor, Canada—The Avro CF-105 is supersonic even while climbing, the Royal Canadian Air Force Assn. was told by Crawford Gordon, Jr., president of Avro Canada Ltd., Toronto. Flight tests are expected to begin next year on a new delta-wing interceptor being built for the RCAF, he said.

Power required to propel the CF-105, Gordon said, will be almost twice that generated by the S. S. Queen Mary. The aircraft unofficially is described as designed for a top speed of 1,500 mph. and a ceiling of 60,000 ft. Powered by the Orenda PS-13 engine built by Orenda Engines Ltd. of Toronto, the plane will be supersonic for both level flight and climbing.

Gordon said the CF-105 will be subjected to loads, stresses and heat never before encountered in a jet-powered operational aircraft. At 1,000 mph. the friction of the air raises the temperature of the skin to 300F. At high altitude with the outside air at −50F the skin temperatures will be 252F.

Plastic canopies are out, Gordon said. The CF-105 will use laminated glass an inch thick.

Gordon noted there will be 60,000 ft. of wiring in the plane and enough electronic tubes for 200 television sets. It will require 24 gal. to start the two engines, and in a normal 40-min. mission they will burn as much fuel as the average motorist uses in six years, Gordon said.

The Canadian executive urged his government to prepare for a long-term aircraft production policy in order to give the industry the necessary stability to meet whatever emergency arises.

He also said that the British defense chiefs are watching the development of the CF-105 with indications that they may order some.

CAB Certifies CH-1A As Four-Place Copter

Wichita, Kan.—A modified version of Cessna Aircraft Company's CH-1 helicopter has been certified by the Civil Aeronautics Board as a four-place helicopter and has been designated the CH-1A.

The CH-1A, an all-metal copter with side-by-side seating fore and aft, is powered by supercharged FSO-470-A 260-hp. Continental engine (AW Aug. 8, p. 54). It has a single lifting rotor and a single tail rotor.

The Continental FSO-470-A is a development of the O-470 used in the Cessna L-19, 310 and 180 series. The horsepower output raises a maximum gross of 3,000 lb. from sea level to 10,000 ft. in less than 12 min.

Formed fibreglass and aluminum wrap-around sides form the nose section. The engine cowling is removable as a single unit in a few seconds through the use of snap-action fasteners for better maintenance.

Carrying a useful load of 1,000 lbs., the CH-1A is certified for cruising speeds of 100 to 120 mph.

Primary structure for the main part of the fuselage is a double-skinned platform with the top serving as the floor for the cabin area. This section houses the fuel cells and lower control assemblies. It also supports the main rotor transmission, engine mounts and landing gear.

Forward mounting of the engine makes possible 360 deg. vision by pilot and passengers. Rear seats are easily removable for cargo storage.

A simplified rotor assembly and transmission eliminates all external linkages, levers, bell cranks, walking beams and swash plates.

Submarine Rescues Helicopter

Navy HSS-1 helicopter roosts safely on the deck of a submarine after making the first successful emergency landing of its kind in American naval history. Helicopter developed mechanical trouble off Key West, Fla., and crew was about to ditch when the submarine USS Corporal surfaced. The helicopter was hauled to Key West aboard the submarine.

R&D Secretaries Asked for All Services

Washington—President Eisenhower has requested legislation that would create a statutory position of Assistant Secretary for Research and Development in each of the three military services.

The Air Force has assigned one of its assistant secretaries to handle research and development, although his activities in this field are not spelled out by law.

In the Army, research and development is now handled by a "director" reporting directly to the secretary. In the Navy, the Assistant Secretary for Air also handles research and development.

The President said that the present set-up, "Although constituting a recognition of the importance of research and development, is not adequate in present circumstances.

"In the United States Air Force, the existing arrangement, while suitable for R & D matters, has resulted in inadequate provision for the coordination of other vital Air Force activities at the assistant secretary level."

"Each of these new offices," the President said, "will assist the secretary in the improved coordination of the R & D functions of the military department concerned.

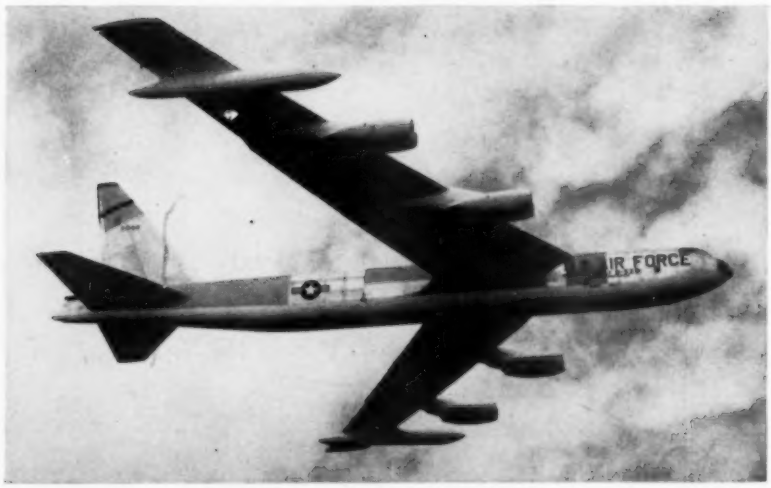
It is my intention to appoint to these new offices individuals experienced in scientific fields and capable of assisting their secretaries full time in reviewing the R & D programs of the military departments to see that they are well coordinated. . . ."

Cornell Seeks Criteria To Forecast Contrails

Buffalo, N. Y.—Exhaust contrail forecasting is a primary goal of an approximately $30,000 Navy project in the physics department of the Cornell Aeronautical Laboratory.

Contrails, produced by hydrogen in hydrocarbon fuels combining with oxygen from the atmosphere, aid enemy detection of aircraft and it is hoped the studies will help eventually to suppress them.

The first year of a contemplated three-year program has been authorized. It will be carried out under joint sponsorship of the Bureau of Aeronautics and the Office of Naval Research.



B-52D on Maiden Flight

First B-52D produced at the Wichita, Kan., Division of Boeing Airplane Co. made its initial flight May 14 with test pilot Rod Randall at the controls. A five-man crew put the eight-jet aircraft through test procedures on a 2 hr., 20 min. flight.

Lobby Charges Hit Non-Skeds

Washington—The alleged lobbyist activities of a supplemental airline caught the spotlight during House Anti-Trust Subcommittee hearings last week when Alexander G. Hardy, National Airlines' senior vice president, submitted a list of what he termed "representatives and lobbyists" for Trans American (formerly North American) Airlines.

Those that were named by Hardy included lawyer Murray Chotiner, retired U. S. Army Gen. Omar Bradley and Sen. Joseph C. O'Mahoney (D.-Wyo.).

Trans American promptly denounced the testimony and asked the subcommittee to provide hearing time for any and all of the individuals named by Hardy in what it called an "irresponsible and baseless tirade."

In his prepared testimony, Hardy charged Trans American with a "deliberate campaign of wholesale violation of the law and defiance of the Civil Aeronautics Board." He asked for a thorough investigation that, he said, would make obvious the "pressure tactics" used by the airline to attain its goals.

Trans American View

Trans American retaliated by asking for "an exhaustive investigation of the whole story of (established) airlines' pressure" on the CAB and other government agencies to bar the certification of new carriers.

During the hearings, Hardy told the subcommittee he asked only that its members look into the relationship between the persons he named and Trans American Airlines. He was cautioned by subcommittee Rep. Emanuel Celler (D.-N. Y.) of the seriousness of his charges.

Celler said, however, that the committee would contact the persons named by Hardy.

Hardy's Indictment

Others that were named by Hardy included:

Hardy McClay and William C. Burt, North American attorneys and once "top level lawyers at the CAB:" Laurence Henderson, former staff director of the United States Small Business Committee; Bill Sturtevant, an assistant to Henderson with "excellent connections;" Maurice Rosenblatt, a high-powered North American lobbyist who also is campaign director of the National Committee for an Effective Congress.

Gardner Jackson, "an effective lobbyist and a top office holder in the Americans for Democratic Action;" Raymond Bowles, an assistant to Sherman Adams when Adams was New Hampshire governor.

Hardy termed Trans American's history a "financial fairy tale" and a real lesson in "how to get rich by violating the law." He accused the carrier of operating daily schedules at fixed departure times in "direct violation of the law."

The "smoke screen" of the company's lobbyists, lawyers and public relations experts has enabled the owners to take out several millions of dollars while posing as small business, Hardy charged.

News Digest

U. S. Marine Corps will receive North American Navy FJ-4 Fury jets, carrier-based fighters. First Marine Aircraft Wing in Japan will get initial planes. Training of ground and maintenance personnel for the FJ-4 is under way at Atsugi Naval Air Station.

Rod Kreger resigned last week as Chief of the Civil Aeronautics Board Congressional Liaison and Public Information Division. At the same time, Edward E. Slattery, Jr. was reinstated as Chief of the Public Information Section by CAB Chairman James R. Durfee, a job from which he was removed by Ross Rizley just before Rizley left the Board in April. Kreger's resignation stems from a disagreement with Durfee over Slattery's reinstatement.

Office of Technical Services, U. S. Dept. of Commerce, has released fourth annual report of Air Force's experimental investigation of materials for handling fuming nitric acid, a rocket fuel. It may be ordered from OTS, U. S. Dept. of Commerce, Washington 25. Price $3.50.

Marine Major Roy L. Anderson delivered first Sikorsky S-56 helicopter from factory to Naval Air Test Center, Patuxent River, Md., for testing.

Climatic hangar at Air Proving Ground Command, Eglin AFB, Fla., recently tested Allison-powered aircraft at 67 deg. They were the McDonnell F-3H-2N Demon powered by Allison J71-A-2 turbojet, Lockheed C-130 Hercules equipped with four Allison T56 turboprop engines, and Northrop F-89D Scropion using two Allison J35-A-355 turbojets.

Republic of Colombia has ordered six Sabre VI jets from Canadair Ltd. in Montreal for delivery June 1.

Planes and spare parts for planes may now be imported into Argentina at free market exchange rate (currently about 40 pesos to the dollar) without surcharge. Exceptions are certain spares for Continental A65 and C85 engines. Planes and parts formerly were imported under the official exchange market (with the dollar at 18 to 1).

Linea Aeropostal Venezolanas (LAV) says it will install radar equipment on planes flying international routes to the U.S., Europe, Cuba and Peru. The airline said the equipment will be installed in three super Constellations LAV expects to extend European flights to Frankfort in 1956, with a stop in Paris.

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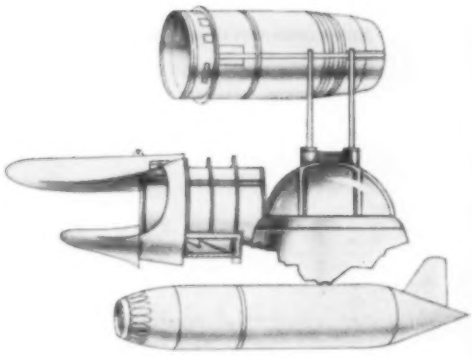

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Canada Installs New Traffic-Control Plan

Beginning June 1, aircraft flying between 9,500 and 23,000 ft. must use IFR regardless of weather.

By L. L. Doty

Washington—Beginning June 1, all aircraft flying over designated Canadian airways between the altitudes of 9,500 and 23,000 feet will be compelled to operate under Instrument Flight Rules (IFR) regardless of weather conditions. (West of Longitude 114, the minimum floor level will be 12,500 feet to account for the Rocky Mountain areas.)

The Canadian order detailing the IFR plan as a traffic-control measure drew generally favorable response from affected U.S. agencies. The lone protest, a vigorous one, was made by the Aircraft Owners and Pilots Association.

Most of the spokesmen were cautious, however, in their appraisal of the plan insofar as its application to U.S. airways are concerned.

CAA Plan

Civil Aeronautics Administration officials, for example, generally felt that, while such a plan is an ultimate goal towards which the U. S. can strive, additional personnel and facilities are essential before any such program can be undertaken.

In its "five-year plan" for federal airways, the CAA has recommended a network of long-range radar installations to police en route flights. The expense of equipping such a system is estimated at $39,536,000, with operations and maintenance costs amounting to $19 million in 1961, the year the program is scheduled to go into full swing.

The CAA report on its plan noted that the demand "for en route control of traffic in good weather" is becoming increasingly apparent. The plan is now being studied by the Air Traffic Control and Navigation Panel of the Air Coordinating Committee together with a report of Study Working Group 13 on the "U. S. Need for Increased Air Operational Capabilities."

A spot check of the airlines indicated general approval of the plan, although several operations technicians stressed that the heavy volume of domestic traffic and the complexities of the U. S. airways preclude any such arrangement for this country without long-range planning and study. One airline official said the Canadian order would not affect operations in Canada since company pilots already were under orders to operate under ATC jurisdiction whenever in Canada.

ALPA Approval

The Air Line Pilots Association has been a consistent supporter of controlled airways traffic under all conditions. Last year at an anti-collision symposium sponsored by the CAA and the Illuminating Engineering Society, Capital Airlines Pilot J. D. Smith, representing ALPA, said there is "a growing movement within ALPA membership to operate all flights within the United States under IFR conditions at all times."

An AOPA representative told AVIATION WEEK that his organization and its affiliate, the Canadian Aircraft Owners and Pilots Association "had protested strenuously" to the Canadian government. He labeled the order "unjustified" and a "form of hysteria," adding: "If the plan proves to be a burden, we will tell our people to stay out" of Canada.

In announcing the order, George C. Marler, Canadian Minister of Transport, said in Ottawa that studies indicated the private pilot normally does not fly above the 9,500-ft. level and should encounter relatively little difficulty in conforming with the order.

National Airport Trial

As an additional concession to private flyers, pilots who do not have a full instrument rating may have their licenses endorsed to qualify them to fly on the airways under VFR conditions subject to the jurisdiction of air traffic control. Endorsement is obtained after passing a modified instrument flying examination less rigid in standards than the regular IFR test.

Somewhat allied to the Canadian plan, although confined to area operations, is a test started August 1, 1955, by the CAA at the Washington National Airport as a "high density air traffic zone." The experiment requires

Pakistan Viscount Touches Down

Pakastani government Viscount, delivered to Pakistan in March, touches down at Teheran Airport in Iran. Slipper tank on wing outside starboard engine is one of two wing tanks carrying 174 gal. each which increase Viscount range by about 200 mi. The tanks are removable.

Address inquiries to: R. James Pfeiffer, Executive Director of Customer Relations, Fairchild Engine and Airplane Corporation, Hagerstown 15, Md.

all aircraft operating in and out of National Airport to establish and maintain two-way radio contact with the tower, observe a 180 mph. speed limit and operate under IFR conditions whenever visibility is less than a mile. An exemption to these rulings was granted private pilots in a section south of the airport.

Charles Parker, executive director of the National Aviation Trades Association representing air taxi services and fixed-base operators, said he "would be surprised" if any of his members fought any U. S. plan designed along the lines of the Canadian system. Most members, he said, hold instrument ratings and are equipped to fly IFR.

The Canadian order sets no restrictions on aircraft flying below 12,500 feet in the region of the Rockies or below 9,500 feet elsewhere. Flight clearance on the designated airways within the restricted altitude layers, or "block airspace," will not be issued unless:

- **A VFR flight plan** is filed with the appropriate air-traffic-control unit.
- **Altitudes are available** and traffic conditions are such that the flight can be accommodated.
- **Aircraft is equipped** with two-way radio.

CAB Decision on Overseas Fares Creates More Problems for IATA

By Craig Lewis

Washington—The international airlines will meet in Cannes this week in an attempt to find a solution to the problems created by the Civil Aeronautics Board decision not to approve the present fare structure on major overseas routes.

The big problem facing the carriers is the fare situation on North Atlantic routes. The CAB doesn't like current Atlantic tourist services, and it doesn't approve of the 10% first-class fare increase passed by International Air Transport Assn. members last October.

Since IATA fares have to be approved by all the governments concerned, the airlines must find a solution that will please the Board and all the other nations involved.

The alternate to this is an open rate and the possibility of a rate war over the rich North Atlantic routes. The CAB has said it is willing to face the consequences of an open-rate situation.

CAB Policy

A clear picture of what the airlines can do to please the CAB can be drawn from a detailed policy statement issued by the Board earlier this month. The main policy point is that the agency favors a cut-rate third class service for the Atlantic.

The U. S. flag carriers have come up with two plans for a low-cost service between the United States and Europe, both of which the foreign airlines view with general disfavor.

The foreign carriers fear they do not have enough equipment to make money on a low-cost, large-volume service. And they feel the CAB has been a trifle high-handed in its treatment of the IATA fare situation.

First indications of the CAB attitude came in February when the Board refused to approve a 10% increase in first-class fares. This kicked up a storm, since the carriers were getting ready to inaugurate the new fares April 1.

The Board relented and approved the new fares until September 30, but it also issued a new approval of tourist fares terminating September 30 instead of December 31 as previously approved.

Low-Fare Proposals

With this temporary approval, came a CAB opinion criticizing IATA airline tourist services as unrealistic. The Board said the carriers are subsidizing luxury services with tourist revenue and suggested that the airlines use higher seating densities and cut out extra services on tourist flights.

Trans World Airlines and Pan American World Airways have discussed the situation with the Board, and each has proposed a low fare plan. TWA would like to offer a $350 round-trip 15 day excursion fare between New York and London on regular tourist flights.

Pan American favors a third-class air service with five-abreast seating, no free meals, no liquor and fewer cabin attendants at a New York-London round-trip fare of $390.

The Pan American approach has received CAB blessing as the type of service it favors. This endorsement lends powerful support to Pan American's idea, since in effect, it tells the IATA carriers what kind of fares and standards the Board will approve.

The CAB said the suggested new service should be inaugurated over Atlantic routes by April 1, 1957, and over Pacific and Latin American routes as soon as traffic warrants.

The Board's stand on the 10% first-class fare increase is unchanged, and it feels the increase should be rescinded on October 1.

The Board maintains that airlines should have a $75 surcharge for passengers who want to travel on sleeperette seats. If a $75 sleeper seat is used, the CAB suggests the airlines charge $100 for upper berths and for lower berths sold on a ship-side (immediately prior to take off) basis.

On polar fares, the CAB favors equalization of fares between Europe and the Far East with the fares charged for flights via India. The Board objects, however, to equalization of fares on the Canadian Pacific Air Lines route via Vancouver since it is longer than the polar and Indian routings.

The Board also objects to any reduction or elimination of the round-trip and circle trip 10% discount. Since most international travel is of a round trip or circle trip nature, the CAB thinks reducing the discount would be very similar to a general fare raise.

According to the CAB, the airlines are suffering a dilution of cargo revenues because specific commodity definitions in the rate structure are not detailed enough to obtain the proper revenue from certain high-value commodities. The Board suggests that the carriers correct the situation by September 30, even though present rates do not expire until December 31.

Tightening of rules covering passenger expenses en route also is recommended by the CAB. The Board said unwarranted absorption of passenger expenses at over-night stops and connecting points are making through services in some areas less attractive than connecting services.

The Board figures that nothing will be accomplished on this problem at the current meeting, so it recommends establishing a group to study the problem and propose restrictions.

In the charter field, the CAB statement asks IATA airlines to incorporate certain rules on group eligibility and unused space into the regulations.

The CAB said it would no longer approve IATA resolutions just because the carriers would not have time to correct them—which was the case with the April 1 fare increase. The Board said IATA should either speed up transmission of full documentation on proposed resolutions or revise its conference schedules to allow more time before fares and regulations become effective.

IATA Helicopter Report

Helicopter manufacturers represented at the San Remo, Italy, meeting of the International Air Transport Association predicted that 25-passenger helicopters will be available to the air transport industry within three-to-five years.

The manufacturers said 40-to-50 passengers helicopters would be available within five years after a decision—which would be based on demand—was reached to go ahead with production.

Adams Predicts Jet Liner Profit

Civil Aeronautics Board Vice Chairman Joseph P. Adams declared last week that U.S. trunk airlines have moved into a favorable position to attract financial investments and investors.

Adams, citing the expansion of the air-travel base in recent years and the promise of growth still ahead, disputed recent airline opinion that the carriers are in a weak investment position and denied other allegations that CAB actions (i.e., the forthcoming fare investigation) are frightening investors away from airline stocks.

The CAB member, in a speech before the Oakland, Calif., Chamber of Commerce, said the airlines already are in a healthly financial condition and predicted that jet operations will be profitable from their inauguration.

Adams quoted recent magazine articles and analyses by investment counsellors to point out "today's market atmosphere surrounding the potential airline investor" is favorable.

"The corporate finances of our domestic trunkline carriers are in a healthy condition," Adams said. "The managements of these carriers may well be proud of their financial progress, taking in stride the several aircraft fleet changes that have taken place since the inauguration of the DC-3 airplane."

Adams said he believes the CAB has a responsibility in making its regulatory decisions to create a favorable atmosphere for the potential air carrier investor. He said the CAB feels its decisions in the past few years have contributed to such an atmosphere.

The CAB official pointed out that 34% of last year's passenger traffic was in coach service. He said the growth of air coach has been a significant factor in broadening the air-travel base, creating a mass transportation medium and improving the airlines as investment prospects.

The move into the jet era will mean a revolution in air transport, Adams said. "It is my belief that jet age civil aviation cannot be properly described as an advance in travel. It is instead a revolution and a complete break with the past." He added:

"It is my prediction that the enthusiastic reaction of the jet-age passenger to this luxury, this simplicity, this security, will guarantee profitable jet air transport operations from the date of their inauguration."

Adams said presently-ordered piston aircraft will fail to keep pace with traffic growth and demands for seats generated by "mass air transportation" in 1957 and 1958 and that the jet age "is not arriving a day too soon."

Burke, Va., Airport Funds Asked

Washington—The Commerce Department last week asked the Budget Bureau for $31 million to begin construction of the long-debated alternate airport for Washington at Burke, Va., some 15 miles away.

The funds, if approved, would be sufficient to make the airport partially operational within two-to-three years. Cost of the complete project has been estimated at $48.5 million by the Civil Aeronautics Administration.

Ten members of the Senate Commerce Committee, overriding the protests of Maryland Sen. John Marshall Butler, urged the department to launch a "high-speed program of construction" at the Burke site with "two or more" contractors engaged on the project in order to complete the task within two-and-one-half years.

In 1950, Congress appropriated $1 million toward an alternate airport. Much of this was expended in the purchase of land near Burke. Subsequent budget requests were defeated, however, and the project has been dormant since that time.

A Commerce Department report to the committee earlier this year recommended Andrews Air Force Base, Md., as the first choice for the airport site and Burke as the second choice. However, Louis Rothschild, Under Secretary of Commerce for Transportation, told the committee he wanted Congress to make the final decision.

Sen. Butler, a Republican who has led the opposition of the Maryland delegation to the Burke site, issued a minority report calling for a new study by the Commerce Department evaluating the relative merits between the Burke location and Baltimore's Friendship Airport as an alternative port.

Five senators, in individual reports, argued that the Secretary of Commerce should select the site for the new airport on the basis of technical advice, despite Rothschild's position that the department wanted Congress to make the selection. The senators: Price Daniel (D.-Tex.); Sam J. Ervin (D.-N.C.); John Bricker (R.-Ohio); James Duff (R.-Pa.) and William Purtell (R.-Conn.).

There was unanimous agreement among all 15 members of the Commerce Committee on the urgency of additional airport facilities for the Capital.

The majority report declared: "A disaster at the (present) airport, because of the growing pressure on its facilities, which no one wants, should not be necessary to focus public attention on this problem."

Five members of the committee urged that Baltimore's Friendship Airport be promptly designated as an alternate terminal for an interim period.

CAB Outlines Stand On New Airline Entrys

Washington—The Civil Aeronautics Board, which has not certificated a trunk airline since passage of the Civil Aeronautics Act in 1938, believes any new entrant into the scheduled system should have "at least" the capital investment as that of a comparable existing carrier.

The CAB set forth its opinion in reply to 34 questions regarding competition in the air-transportation field asked by the Senate Small Business Committee. The committee, headed by Sen. John Sparkman (D.-Ala.), has repeatedly criticized the CAB for allegedly conducting a "closed door" policy towards new carriers. CAB said:

"As a general proposition, it would seem reasonable to assume that the essential capital requirements necessary to inaugurate operations of a scope comparable to those of any presently-certificated carriers would be at least equal to the present invested capital of the certificated carrier and would probably exceed its reported investment by a substantial amount since, to a very large extent, equipment units presently utilized have been substantially depreciated and were acquired at favorable prices no longer available."

The Board estimated the capital requirement for new entrants, as follows:

- **For a transcontinental** operation, from $20 million to $127 million.
- **For a regional operation**, from $15 million to $37 million.
- **For a local-service** operation, from $260,000 to $1.9 million.

CAA Approves DC-7C For PanAm Service

The Douglas DC-7C Seven Seas has been certificated by the Civil Aeronautics Administration and is ready to go into service with Pan American World Airways on June 1.

The DC-7C first flew on Dec. 20, and the certification program was completed six weeks ahead of the July 1 target date. Test performance of the new transport indicates a gross takeoff weight of 143,000 lb., as compared with a design guarantee of 140,000 lb. Sea level takeoff runway requirement at 139,000 lb. is 5,800 ft. as compared with a guaranteed 6,950 ft., and landing runway requirement at 107,000 lb. is 5,360 ft. against a guaranteed 5,400.

Airline Revenues and Expenses—1st Quarter

(Dollar Amounts)

	Passenger Revenues	Mail Revenues	Express Revenues	Freight Revenues	Subsidy	Total Operating Income	Total Operating Expense	Net Operating Income (before taxes)
DOMESTIC TRUNK								
American	$55,733,643	$1,606,484	$1,094,195	$3,227,371		$62,486,843	$57,157,660	$5,329,183
Braniff	9,707,347	235,299	135,550	255,075		10,535,833	9,822,365	713,468
Capital	10,909,744	282,263	231,024	240,181		11,872,867	13,402,833	−1,529,966
Colonial	1,491,806	24,060	9,813	40,240	100,797	1,691,753	1,818,559	−126,806
Continental	3,720,176	100,553	34,949	103,752	340,616	4,401,516	4,137,487	264,029
Delta	15,055,082	341,768	251,188	429,240		16,525,953	14,128,101	2,397,852
Eastern	55,223,895	1,030,878	504,097	651,074		58,724,217	46,024,288	12,699,929
National	15,838,549	298,100	90,095	362,920		17,262,997	12,947,380	4,315,617
Northeast	1,349,461	24,686	19,989	28,117	502,602	1,956,558	2,308,877	−352,319
Northwest	9,482,552	382,725	245,558	468,376		10,816,301	11,755,692	−939,391
Trans World	33,691,837	1,039,605	803,150	1,182,348		37,355,088	40,171,039	−2,815,951
United	47,354,494	2,259,162	1,108,172	2,106,331		54,267,993	53,432,689	835,304
Western	1,282,151	33,855	16,085	22,684		1,403,675	2,980,592	−1,576,917
INTERNATIONAL								
American	1,288,729	42,438	459	152,944		1,532,483	1,211,053	321,430
Braniff	1,281,432	98,558		92,867	251,365	1,818,180	1,726,751	91,429
Caribbean Atlantic	433,490	4,793		14,387		490,405	356,254	134,151
Colonial	206,290	1,318		3,491	13,337	233,139	353,781	−120,642
Delta	1,164,357	17,112		52,390		1,262,195	1,198,520	64,411
Eastern	2,899,800	66,599		46,115		3,075,488	2,091,705	983,783
National	1,263,523	9,894	4,803	16,250		1,361,225	863,594	497,631
Northwest	2,966,157	1,490,020	15,096	885,012		5,456,366	5,557,494	−101,128
Pan American								
Alaska	673,189	40,090		156,924	351,099	1,427,696	1,788,412	−360,716
Atlantic	15,262,979	2,322,412		2,010,762	441,609	21,894,741	23,805,566	−1,910,825
Pacific	11,128,340	1,914,999		1,422,132	116,280	15,233,807	14,178,106	1,055,701
Latin America	15,292,395	764,061		2,468,345	1,538,114	21,184,405	20,545,685	638,720
Panagra	3,643,270	234,336		416,351	5,077	4,896,628	4,408,222	488,406
Trans World	7,963,578	1,735,732		842,979		11,142,931	14,373,461	−3,230,530
United	2,475,042	102,166		36,093		2,738,267	2,455,726	282,541
LOCAL SERVICE								
Allegheny	748,804	23,337	27,118	3,118	399,879	1,226,740	1,439,895	−233,155
Bonanza	389,521	8,727	5,930	8,457	244,843	676,532	721,991	−45,459
Central	229,594	9,242	4,014	7,686	525,234	781,447	788,520	−7,073
Frontier	816,652	30,499	11,441	47,381	583,553	1,500,522	1,421,656	78,866
Lake Central	263,527	7,991	16,077		347,476	636,384	668,164	−31,780
Mohawk	836,898	10,366	10,430	15,170	158,166	1,051,302	1,235,629	−184,327
North Central	1,214,433	41,438	45,249		415,521	1,729,784	1,715,326	14,458
Ozark	616,375	26,483	15,616		508,307	1,176,291	1,289,150	−112,859
Piedmont	969,277	24,128	12,284	13,351	479,077	1,532,855	1,750,492	−217,637
Southern	430,321	19,245	13,727		413,638	898,665	928,138	−29,473
Southwest	649,925	22,352	9,599	14,854	236,666	980,085	1,121,504	−141,419
Trans Texas	627,297	24,019	11,701	22,047	606,260	1,302,551	1,330,226	−27,675
West Coast	456,716	13,666	5,047	7,710	363,972	855,047	988,283	−133,236
HAWAIIAN								
Hawaiian*								
Trans Pacific	351,297	2,159		14,641	12,774	391,906	493,699	−101,793
CARGO LINES								
Aerovias Sud Americano*								
Flying Tiger*								
Slick		20,487		1,499,938		3,412,460	3,505,752	−93,292
Riddle*								
HELICOPTER								
New York Airways	50,459	7,501	7,489	6,116	355,277	429,498	405,876	23,622
Los Angeles Airways	20,028	32,535	21,721		186,935	264,635	260,307	4,328
Helicopter Air Service		16,902			98,234	119,246	118,926	320
ALASKAN								
Alaskan	85,767	29,059	2,273	88,046	212,227	426,638	450,285	−23,647
Alaska Coast	94,306	25,306		13,374	79,187	234,792	284,080	−49,288
Byers Airways	4,249	5,027		2,549	12,065	27,528	27,230	298
Cordova*								
Ellis Air Lines	65,587	13,015		9,516	54,620	151,642	203,677	−52,035
Northern Consolidated	92,931	77,620	530	42,758	185,369	635,743	633,520	2,222
Pacific Northern	96,974	50,388		30,137	36,965	231,148	256,542	−25,394
Reeve Aleutian*								
Wein Alaska	112,377	108,699		44,720	233,224	1,115,993	1,043,156	72,837

*Not available.
Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board.

Mid-Manhattan Helicopter Service By October Promised: Cummings

New York—Passenger helicopter service linking midtown Manhattan to La-Guardia and Newark airports will be inaugurated before October, possibly by late August, Robert L. Cummings, Jr., New York Airways president, announced last week.

Negotiations between the City of New York and the Port of New York Authority for use of the West 30th Street heliport site are progressing satisfactorily, Cummings said, and initial plans call for five round trips daily utilizing the airline's Sikorsky S-55 rotorcraft.

Schedule Growth

Schedules will be stepped up to 20 to 25 daily flights several weeks after the first operations. New York International Airport then will be connected to the circuit, and night flights will be instituted shortly afterward. The S-55s will be equipped with especially designed floats, which will be available next month, the NYA official said.

At the press conference called to describe the carrier's future plans, Cummings said that commercial helicopter transportation is on the verge of dispensing with subsidy and is ready to realize a vast, untapped market. But to do this, he said, there is an immediate need for helicopter operators to work together, with the manufacturers, and with the Department of Defense to solve the problem of equipment.

The manufacturers, he said, haven't been made sufficiently aware of the demand that exists for a suitable commercial helicopter. New York Airways would have "money on the line" for 12 to 15 of them, Cummings said.

Must Show Proof

It is essential for the operators to document this need, Cummings said, and to win the cooperation of manufacturers and military. If they succeed—and he expressed confidence that they would—a commercial helicopter would be available in three or four years.

With a helicopter that could achieve a direct operating cost of 10 cents per seat-mile, Cummings said, New York Airways could charge its short-haul passengers about 25 cents a seat-mile. Costs are about 80 cents with present S-55 equipment and will be about 50 cents with S-58 equipment on order for delivery in September. Bulk of the airline's future business would be carried on high-frequency flights, with space reserved only at extra cost.

Among other points touched on by Cummings at the conference:

- **New York Airways** is most impressed by Bristol helicopter developments, recently inspected in England, including the tandem-rotor Bristol 173 and a twin-turbine model under development.
- **It is too early** to say which manufacturer is leading in the development of a commercial machine that would best meet New York Airways helicopter requirements.
- **The noise problem** must be solved or there will be no business. The S-58 is slightly quieter inside, not much noisier outside, than the S-55. Turbine-driven helicopters will be quieter than present machines.
- **Cummings doesn't** believe vertical takeoff aircraft will replace the helicopter commercially in the foreseeable future.
- **New York Airways** is trying to arrange a visit to observe Russian helicopter developments.

Senate Group Assent To Re-Equipment Plan

Washington—The Senate Commerce Committee has approved legislation designed to aid subsidized carriers in financing re-equipment programs by permitting them to set aside earnings on old equipment sales without having their subsidies reduced.

The legislation would over-ride the Civil Aeronautics Board's policy of deducting capital gains on equipment sales from subsidy payments. The measure was vigorously opposed by the Commerce Department, by two members of CAB (former Chairman Ross Rizley and Joseph Adams) and by the General Accounting Office. Rizley and Adams said the legislation could open the way for "windfall" subsidies to some carriers. CAB members Chan Gurney and Harmar Denny supported the measure. (AW Apr. 23, p. 142).

The House Commerce Subcommittee on Aviation already has held hearings on similar legislation sponsored by two ranking members of the group, Rep. Oren Harris (D.-Ark.), chairman, and Rep. Carl Hinshaw (R.-Calif.).

CAB's policy of reducing subsidy payments because of income from equipment sales, the Senate Committee, declared, "presents carriers with a very real problem, particularly at a time when they are faced with the necessity of replacing their obsolete fleets of aircraft. . . . Because of the tremendous increase in the price of new aircraft since the war, any carrier proposing to acquire new aircraft for replacement purposes is faced with a major financing problem. This problem is accentuated if any capital gains realized on the sale of its existing fleet are to be offset against its ordinary income received from the government."

Failure to have modern equipment, the committee observed, "places a carrier at a heavy disadvantage with respect to passengers. This, in the end, means less income and larger subsidy payments, defeating the major objective of existing law to strengthen air transportation."

The legislation also clarifies the position that CAB is to continue to consider losses on equipment in determining subsidies.

It applies only to flight equipment—airframes, aircraft engines, aircraft propellers, aircraft communications and navigational equipment, improvements to leased flight equipment, flight equipment spare parts and assemblies.

Free Rides for Ministers?

Legislation permitting the airlines to offer free or reduced-rate transportation to bona fide ministers of religion has received Senate Commerce Committee approval.

The committee stipulated that the ministers would have to travel on a space available basis without displacing regular-fare passengers. The railroads already allow ministers to purchase a $3 book that is good for one year and permits them to purchase transportation for one-half price.

CAB ORDERS

(May 10-16)

GRANTED:

Pan American World Airways an exemption to serve Kano, Nigeria.

Permission to intervene in the investigation of Intra-Alaska air services to the Anchorage Chamber of Commerce, the City and Chamber of Commerce of Kodiak, the Air Line Pilots Assn., Alaska Coastal Airlines, Ellis Air Lines, Northwest Airlines and the Postmaster General.

Permission to intervene in the Great Lakes-Southeast Case to the Charleston, W. Va., Chamber of Commerce and the County Board of Kanawha County, W. Va.; City of Detroit and the Detroit Board of Commerce; City of Jacksonville and the Jacksonville Chamber of Commerce; Greater Miami Traffic Assn.; Greater Orlando Chamber of Commerce; Tallahassee Chamber of Commerce; City of Toledo and the Toledo Chamber of Commerce; Board of Commissioners, Ohio County and the Ohio Valley Board of Trade; Wheeling Area Conference on community development; Airport Commission of Forsyth County, N. C., Forsyth County Board of Commis-

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sioners and the Winston-Salem Chamber of Commerce. Petitions of 11 organizations and communities were denied.

Permission to intervene in the Seven States Area Investigation to the Brookings, S. D., Airport Board; Air Line Pilot Assn. Intl.; City of Hot Springs, S. D., and the Hot Springs Chamber of Commerce; City of North Platte, Neb.; the North Platte Chamber of Commerce; City of Scottsbluff, Neb., and the Scottsbluff Chamber of Commerce.

North Central Airlines an exemption to start its summer service to Land O' Lakes, Wisc., on May 25.

Permission to intervene in the Puerto Rico Service case to the Mayor and City Council of Baltimore and the Baltimore Assn. of Commerce.

Flying Tiger Line an exemption to perform round-trip trans-Atlantic charter flights pursuant to contracts with the University of Chicago Student Government; Milwaukee Maenner and Damenchore Reisegesellschaft; Ridgewood Heights Singing Society; Student project of Amity Among Nations; Salvation Army; Southern Territorial Headquarters; the History of Science Society; World Affairs Council of Oregon; Dept. of Agriculture Welfare and Recreation Assn. Travel Club; Dept. of Health, Education and Welfare Employees' Assn.

Sioux Falls, S. D., Chamber of Commerce permission to intervene in the investigation of Braniff Airways' service to points in the North Central states.

APPROVED:

Agreements involving Continental Air Lines, Ozark Airlines and various other carriers relating to intercarrier arrangements.

Los Angeles Airways' flight pattern revision adding two round trips daily except Sunday between Los Angeles International Airport and North Hollywood via Glendale and Alhambra.

Airborne Flower and Freight traffic's acquisition of control of Cross-World Air Cargo Corp. Interlocking relationships between J. D. McPherson, D. I. Babcock, M. B. Hospitalier, Airborne, Airgo Intl. Corp. and Cross-World were approved.

Flying Tiger Line's petition for reconsideration of earlier CAB action denying an exemption to perform a transatlantic charter flight for Michigan-Ann Arbor-Washtenaw Council of Churches, since the petition gives the Board information not available earlier.

Riddle Airlines' agreements with Argonaut Airways Corp. and Southern Air Transport calling for leasing by Riddle of certain C-46 aircraft on a single trip basis for a one year period. Argonaut and Southern were granted exemptions to permit them to provide the services to Riddle.

Wien Alaska Airlines' acquisition of the routes and certificate of Byers Airways for $25,000. The purchase is subject to the labor protective provisions defined in the Flying Tiger-Slick merger case.

ORDERED:

Slick Airways, Flying Tiger Line and American Air Export and Import Co.'s authority to carry mail and express stayed until May 24 pending action on a petition for stay filed with the U. S. Court of Appeals.

Riddle Airlines' authority to carry mail was also stayed, but exemption authority for all carriers to carry surface mail was extended to May 24.

DISMISSED:

Flying Tiger Line's application to perform a roundtrip charter flight between Hartford, Conn., and Stuttgart pursuant to a contract with Connecticut Staats Saenger Bund, at the request of the applicant.

Flying Tiger Line's application to perform two roundtrip charter flights between New York and Paris/Geneva, returning from Frankfurt/Paris pursuant to a contract with George Pepperdine College, at the request of the applicant.

DENIED:

Applications for exemption authority to allow Southern Airways to operate between Myrtle Beach and Greenville, S. C., via Columbia and Spartanburg from June 1 to the Wednesday following Labor Day.

Eastern Air Lines' motion to dismiss the Eastern Air Lines enforcement proceeding.

Eleven Airlines Report Salaries

Reports of salaries of officers and directors of the following scheduled airlines have been filed with the Civil Aeronautics Board:

Alaska Airlines, Inc. Nelson David, director, president and general manager, $24,999.60 salary, $200 director's fee, $1,250 bonus and indirect compensation; Frank C. LaGrange, director, $150 director's fee; Keith M. Lesh, director, $150 (up $50), director's fee; Raymond W. Marshall, director, $200 fee (up $100); Roland P. Place, director, $150 fee; Homer W. Robinson, chairman of the board of directors, $200 fee; Ross A. Urquhart, director, $50 fee (down $50); Jay G. Larson, director, $100 fee.

Ralph W. Starkey, vice president, $11,200 salary, $1,200 bonus and indirect compensation (up $1,200); Thomas A. Campobasso, vice president, $8,400.86 salary, $1,200 bonus and indirect compensation; Robert J. Norris, secretary-treasurer, $8,400 salary, $100 director's fee, $900 bonus and indirect compensation; Donald L. Ingalls, assistant secretary-treasurer, $8,025 salary (up $225); Juliana D. Wilson, assistant secretary-treasurer, $675 salary, $1,251.32 for services as legal counsel; Pogue & Neal, Washington legal counsel, $45,063.92 (up $1,627.93); Allen, Deggarmo & Leedy, general legal counsel, $14,651.62 (down $3,476.48); Thomas Anderson Transportation, cargo handling services, $27,685; Ray L. Jenkins, special legal counsel, $21,000.

Byers Airways Inc. Robert D. Byers, president, $14,400 salary, $100 bonus and indirect compensation; Gladys T. Byers, vice president, $2,300 salary, $100 bonus and indirect compensation; Frank Jones, assistant secretary, $8,600 salary, $100 bonus and indirect compensation; Mildred Bettisworth, secretary-treasurer, $6,575 salary, $100 bonus and indirect compensation.

Cordova Airlines Inc. Merle K. Smith, president, $12,000 salary, $2,500 bonus and indirect compensation; Bertha C. Smith, director, $3,600 salary.

Ellis Air Lines. R. E. Ellis, president, $14,400 salary; G. A. Bodding, vice president, $13,200 salary; R. L. Elliott, director, $11,700 salary; N. T. Gerde, secretary-treasurer, $12,300 salary; W. A. Nebel, director, $10,800 salary; J. L. Sherman, vice president, $12,300 salary; K. J. Vanderweele, director, $8,100 salary.

Northern Consolidated Airlines Inc. Victor R. Davis, secretary, $9,950 salary, $1,000 bonus and indirect compensation; Marie A. Peterson, assistant secretary, $1,892.31 salary; Raymond I. Peterson, director, president and general manager, $18,000 salary; Stuart B. Fitzhugh, director, treasurer and comptroller, $12,425 salary, $1,000 bonus and indirect compensation; Robert J. Stevenson, director and vice president, $2,430.93 salary; John A. Walatha, director, $12,216.50 salary, $1,000 bonus and indirect compensation; Theodore Seamon, legal services, $14,737.44.

Pacific Northern Airlines, Inc. A. G. Woodley, president, general manager and director, $26,667.46 salary, $200 bonus and indirect compensation; J. H. Foster, vice president-engineering and maintenance, $12,000 salary; J. A. Cunningham, vice president-operations and director, $15,000 salary, $200 bonus and indirect compensation; H. A. Olsen, vice president-traffic and sales, $12,000 salary; C. W. Nelson, secretary-treasurer and director, $10,375 salary, $200 bonus and indirect compensation; D. B. Hart, assistant secretary, $7,750 salary; M. E. Diamond, assistant secretary, $7,750 salary; G. P. O'Grady, director, $200 bonus and indirect compensation; R. A. Rowan, director, $200 bonus and indirect compensation; Paul Porzelt, director, $100 bonus and indirect compensation; M. B. Kirkpatrick, director, $200 bonus and indirect compensation.

Wien Alaska Airlines, Inc. George B. Rayburn, director, executive vice president and treasurer, $12,000 salary, $2,214.70 bonus and indirect compensation (up $384.62); Fritz Wien, director, vice president and operations manager, $11,600 salary, $1,346.66 bonus and indirect compensation (up $811.34); Sigurd Wien, president and general chairman of the board and manager, $15,000 salary, $1,848.08 bonus and indirect compensation (up $561.96); James P. Whaley, vice president and general traffic manager, $11,600 salary, $979.85 bonus and indirect compensation (up $979.85).

Reeve Aleutian Airways, Inc. Robert C. Reeve, president, $18,000 salary (up $3,000); Robert L. Hanson, vice president, $12,000 salary (up $1,200); Margaret Rutledge, secretary-comptroller, $9,300 salary (up $600); Janice M. Reeve, treasurer, $12,000 salary (up $3,000).

Resort Airlines. Clinton Davidson Jr., chairman of the board, $15,000 salary; Harold L. Graham, Jr., president, $15,000 salary, $13,610 bonus and indirect compensation; Douglas P. Larsen, vice president-operations, $8,091 salary, $11,110 bonus and indirect compensation; James F. Murray, vice president and comptroller, $6,748 salary, $11,110 bonus and indirect compensation; Van Buren Nixon, vice president-maintenance, $8,046 salary, $11,110 bonus and indirect compensation; John P. Simpson, secretary-treasurer, $6,000 salary; Richard A. Miller, treasurer, $5,460 salary; Harry B. Taylor, comptroller, $2,989 salary; Clinton Davidson, vice president and director, $15,000 bonus and indirect compensation.

Caribbean Atlantic Airlines, Inc. Dionisio Trigo, president, $16,500 salary; Benigo Trigo, vice president, $6,500 salary; Jose M. Sierra, vice president-operations, $13,000 salary; Robert B. Forrest, vice president-traffic and sales, $9,000 salary; L. A. Lockhart, treasurer, $8,600 salary.

Riddle Airlines, Inc. John Paul Riddle, president and director, $20,000 salary (up $10,371); Peter T. Craven, executive vice president, treasurer and director, $12,233 salary (up $4,034); Jane B. Ramsey, secretary, $4,850 salary (up $750); J. William Liversedge, assistant secretary and assistant treasurer, $7,950 salary; Charles L. Hood, vice president-sales, $9,675 salary (up $675); Jack Schopenhauer, vice president-maintenance, $10,200 salary; Harry T. Weaver, regional vice president-New York, $8,100 salary (up $300); Orlando Torres, regional vice president-Puerto Rico, $9,600 salary; William B. Thompson, regional vice president-Washington, $1,200 salary (up $700); Dixon, De Jarnette, Bradford and Williams, legal services, $10,300; Hal Leyshon and Associates, public relations services, $10,500; Harry Bowen, legal, $18,550.

Britannia Challenges U.S. Jet Airliners

By William Coughlin

Bristol, England—Bristol Aeroplane Co. is attempting to invade the U. S. domestic airline market with its 100-passenger turboprop Britannia.

Bristol and Capital Airlines are negotiating a contract which would put Britannia 300s into U. S. service next year, well ahead of the Lockheed Electra.

To enable the Britannia to go into early service on Capital routes, British Overseas Airways Corp. will accept later delivery of some of its 33 Britannias on order. Five of its Britannia 300 series would go to Capital next April under this arrangement.

Capital, whose Vickers Viscount orders set the pace in the U. S. for turboprops, apparently is ready to buy the $3.5-million Britannias in order to get a jump on competitors who have ordered the Electra. Delivery earlier than the Vanguard undoubtedly was a deciding factor in the shift from Vickers.

To back its invasion of the U. S. market, Bristol is preparing to take these steps:

- **Send a Britannia 100** on a nationwide demonstration tour of the U. S. similar to recent visits to European markets. This probably will be in mid-July.
- **Offer a medium-range** Britannia based on the Capital specifications.
- **Start work on long-range** Britannia 400 series. This aircraft with Bristol B.E. 25 engines will have longer fuselage and what will be in effect a thinner wing. This aims at making it a significant high-speed competitor to U. S. turbojets on the North Atlantic.

In addition to the five BOAC aircraft, Capital is expected to order ten of the heavier Britannia 310 series, which will be a medium-range model designated the 315. There would be options on additional aircraft. The Capital order of well over $50-million would establish the Bristol turboprop as the first strong British competitor to U. S. manufacturers in the large transport field.

Civil Aeronautics Administration certification already has been initiated with the visit of a CAA team to Bristol to study the Britannia. The company now is awaiting the CAA report on changes which may be necessary to achieve U. S. certification.

Competitive, Complementary

Peter Masefield, managing director of Bristol Aircraft Ltd., the airframe subsidiary of Bristol Aeroplane, sees the Britannia as competitive with the Electra and complementary to the Douglas DC-8 and Boeing 707. But the big Bristol turboprop may be more than just complementary. The decision by Canadian Pacific Airlines to order Britannias instead of jets for its transpolar and transpacific routes makes that apparent.

Masefield, formerly chief executive of British European Airways, is aware of two important areas where the British aircraft industry has been open to criticism—meeting delivery dates and after-sales service.

Bristol's record in the past has not been unmarred. The Britannia itself is two years behind the schedule BOAC originally set for it. But Masefield is determined to change all that.

"We will set delivery dates and meet or beat them," he says. "And we're determined to back the airplane up with the best after-delivery service available anywhere."

A spares depot would be set up in Washington or New York to support the Capital purchases. An up-to-date training school for flight and ground crews has been established at Bristol to train free the personnel of Britannia purchasers. Organization of worldwide technical support is underway.

To the next purchaser in line after Capital, Masefield offers a very specific delivery date: April 27, 1958.

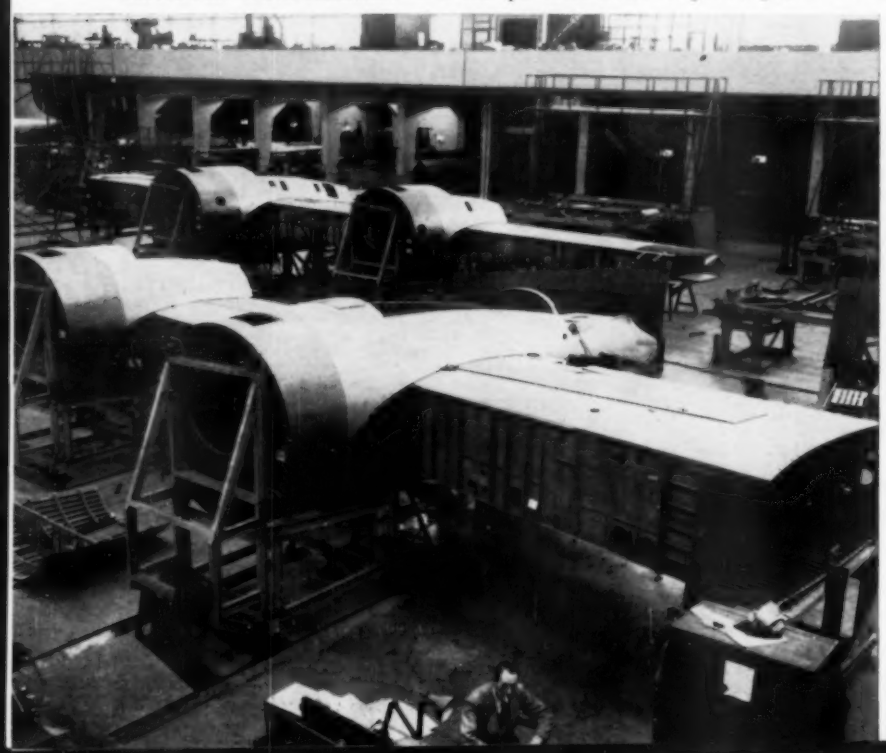
The Bristol managing director believes the market potential for the Britannia lies somewhere between 300 and 400 aircraft. The company's break-even point, he estimates, is 80 aircraft. The Capital sale, together with others now under negotiation, will put Bristol very close to that figure.

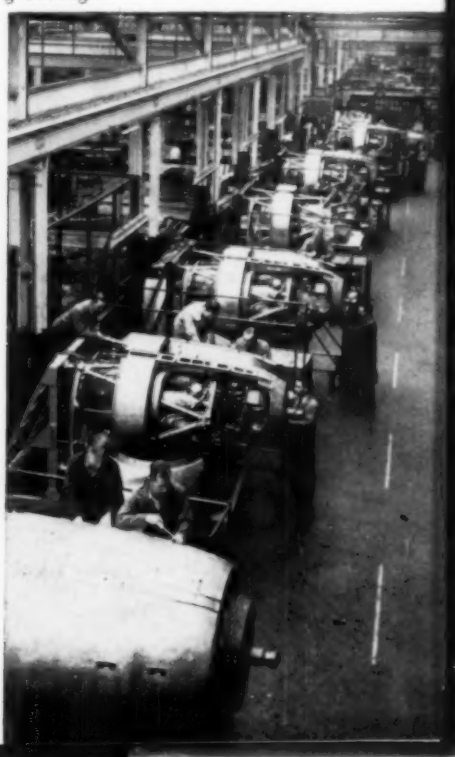
Britannia Family

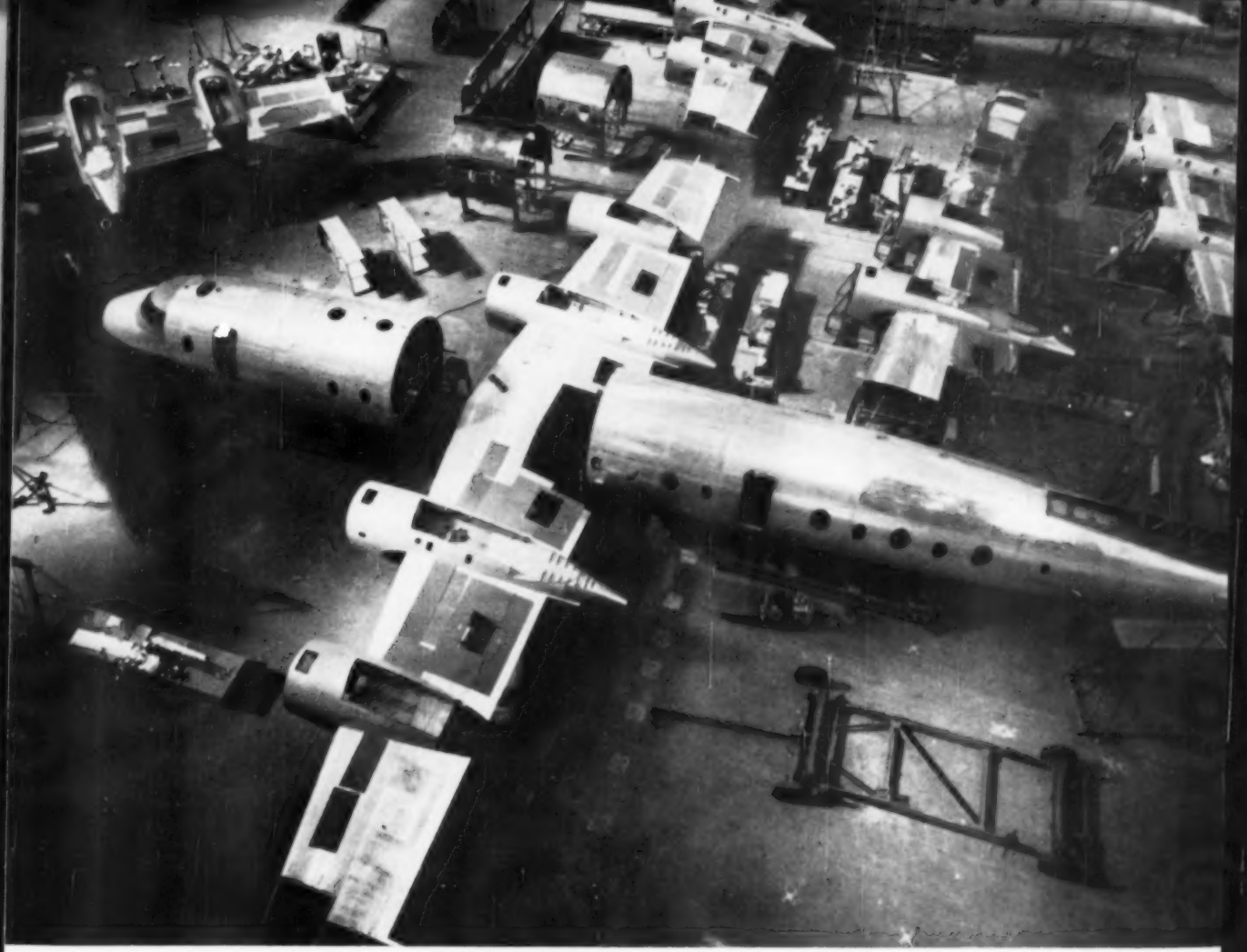
These are the Britannias which the company will produce:

- **Mk. 100.** Powered by the Bristol Proteus 705 turboprop engine with a total equivalent horsepower of 3,780, gross weight of this aircraft is 155,000

BRITANNIA WING ASSEMBLY is of box spar construction. Engines (right) have low-drag cowlings.







FUSELAGE SECTION with other main assemblies (above) before assembly into single unit. Upper center section panel which joins fore and aft fuselage has yet to go into position. General view of airframe assembly hall (below) showing internal structure of a number of fuselage sections in center. At rear can be seen circular jigs in which various fuselage sections are first assembled.

riveting machines," says Maurice Tun-

lbs. It has a 140-ft. wingspan, 114-ft. length. Cruising at 375 mph., it can carry 90 passengers. Still air range with maximum payload is 3,370 mi. BOAC ordered 15.

• **Mk. 250.** This is a combined freight/passenger aircraft similar to the 300 series. Three have been ordered by the Ministry of Supply and six by the Royal Air Force.

• **Mk. 300.** Engines for the 300 series are Proteus 755s which will turn out 4,120 total equivalent horsepower. Fuselage has been lengthened 10 ft. The 300 can carry a greater payload than the 100 over similar ranges. Gross weight is 165,000 lbs. In addition to the prototype, seven have been ordered by BOAC.

• **Mk. 310.** A long-range aircraft designed to provide nonstop service in both directions over the North Atlantic, the 310 has a 175,000-lb. gross weight and carries 8,486 imperial gallons of fuel compared to 6,670 for the 100 series. BOAC ordered 11, El Al Israel Airlines ordered three with an option on one, and Canadian Pacific ordered five with options on five.

• **Mk. 315.** This medium-range airliner, based on Capital specifications, will be a Mk. 310 with weight reduced by omission of long-range tanks and reduction of lavatory and crew space. It also will be provided with various quick turn-around facilities such as integral steps.

• **Mk. 400.** Fuselage of the 400 will be 10 ft. longer than the 310, 20 ft. longer than the 100. B.E. 25 turboprop engines will provide full 4,000 hp. up to 20,000 ft., enabling the aircraft to operate from major airports at any altitude at any temperature without sacrifice in payload. An extended leading edge will increase the chord to give the effect of a thinner wing, resulting in an aircraft which will cruise at more than 400 mph. To get the utmost out of the Britannia design, Bristol may set back its proposed 500-mph. 130-passenger Type 187.

"We will stretch the Britannia to the limit before going on to a new airplane," Masefield says.

Sales Confidence

Bristol is confident of a market for the Britannia. Sales Manager Roger White-Smith sees it this way: The Britannia will be the only airplane available to fly the Atlantic non-stop comfortably in both directions by 1957; it will make a lot of money for its owners; when jets come in on the transatlantic route, the Britannia will have been in service for almost three years and for high-standard tourist travel will be complementary to the jets.

"If you accept all that," says White-Smith, "we are the only aircraft in the business—that's the market."

The economy and quiet operation of its turboprop engines are big selling points in the Britannia's favor. It is without doubt one of the quietest aircraft in the air today. A recent test by the Royal Swedish Civil Air Board verified that during a Britannia visit to Stockholm-Bromma Airport. A noise-level check made on takeoff showed the Britannia quieter than a Douglas DC-3 and well below the DC-6B.

BOAC Plans

BOAC planned to put its Britannia 100s in service between England and South Africa in early July. Engine flameout problems may set this service back to August (AW May 14, p. 30). The schedule calls for extension of service to Australia in September and to the Far East early next year.

The airline hopes to begin operation of its long-range 310s over the North Atlantic during 1957 and may use them to re-open its South American route, which was closed after the de Havilland Comets were withdrawn from service.

BOAC's deputy operations director, H. O. Houchen, says company pilots have been very well pleased with the Britannia's performance during route-proving trials. "It meets all the performance standards very well," he comments.

Britannia Troubles

Like other airliners, the Britannia has had its teething troubles. Latest occurred two weeks ago when it was discovered the Proteus 705 was susceptible to flameouts under certain icing conditions.

Ice also forced temporary grounding of the Britannias earlier this year when BOAC pilots found controls freezing under cold weather conditions. This was traced to an accumulation of moisture in the tail cone. BOAC says the difficulty has been solved.

"We've operated four proving flights to Johannesburg without incident, except for the flameouts," Houchen reports.

All route-proving flights arrived on or ahead of schedule, Houchen says.

Capt. A. S. M. Rendall, flight superintendent of BOAC's Britannia fleet, says cockpit visibility is better than the Lockheed Super Constellation and de Havilland Comet although not as good as the Boeing Stratocruiser.

Production Plans

Final assembly lines for the Britannia are at Bristol's Filton plant and at Short Bros. and Harland in Belfast, Ireland. Masefield believes capacity at these two plants will be sufficient to handle any necessary expansion in production.

Short now is building 21 Britannias. The first Mk. 300 from the Belfast plant is scheduled to fly in October of this year and the first Mk. 250 in July, 1957. From then on, Short expects to turn out at least two a month. Long-range plans call for one a week.

A new $1.4-million plant, already under construction at Belfast exclusively for Britannia production, is due for completion late next year.

The present schedule at Filton is for delivery of 12 Britannias this year, 16 in 1957 and 20 in 1958. New orders will, of course, change this program. Delivery of Mk. 100s is to be completed by March of next year. First Mk. 300 is scheduled to fly this June and the first 310 in December.

Subcontracting Helps

L. R. Benton, chief production engineer at Filton, believes Britannia production could be stepped up to 40 a year with the aid of subcontracting. The two plants thus could turn out more than 90 aircraft a year, sufficient to meet demand in the immediate future.

Subcontracting is carried further on the Britannia than on any major U.S. airliner. Possibly as much as 90% of the structure is subcontracted. In terms of man-hours, subcontracting totals 50%.

Apart from minor subassemblies, Bristol itself builds only the inner wings and leading edges of the Britannia. This extensive subcontracting is made possible by the unique panel construction employed on the turboprop airliner.

Benton considers the use of panels the keynote to Britannia construction. "There is no question about the time saving," he says. "We get out of the major assembly jigs much faster than possible otherwise."

Panel Construction

The Britannia fuselage is made up of 38 panels. Built individually in panel jigs, these average 45-in. wide and are up to 24-ft. long. Each panel is built complete with frame, stringers and skin, including windows where required.

Final assembly jig for the fuselage is a series of external rings and wooden formers, a very simple jig. The panels are fastened to the inside of the rings and then joined. This is the only hand riveting on the fuselage.

"One result is that we get no errors in joining," Benton points out. "Working from the outside as we do, the skins always mate flush when fuselage sections are joined."

The floor is also installed while the fuselage sections are in the assembly jigs.

The panel nature of the Britannia fuselage was dictated more than anything else by the desire to go to squeeze riveting for a good finish.

"We had to restrict the assemblies to a size to fit into the jaws of squeeze

riveting machines," says Maurice Taunton, structures designer. The automatic spin dimpling technique made possible by the panel design does much to provide the uniform finish of the Britannia skin.

The wing of the Britannia is of box spar construction, which Taunton believes to be the most efficient load-carrying arrangement for a wing of this thickness.

"And since we need a thick skin for torsional stiffness, it is also efficient to make the skin load carrying," he notes.

The wing's single box spar is unbroken from wingtip to wingtip with no undercarriage cutouts. This lack of cutouts offers big advantages both weight-wise and fatigue-wise.

As few ribs as possible are used in the wing. The Bristol designers in fact have used the engine nacelles as external stabilizing ribs. This not only results in weight-saving but also reduces the number of bags needed in the wing tanks.

Leading and trailing edges are entirely secondary structure with chord-wise stiffeners. Another structure gain is achieved from the fact that the thickness chord ratio varies from 13% at the tip to 17% at the root.

Vertical and horizontal stabilizers are of single box spar construction similar to the wing. The horizontal stabilizer is a continuous tip-to-tip structure hung from four attachments beneath the fuselage. While the fin is basically a box structure, it changes to a two-spar construction at the base, where it fastens to the stern frame. Flying controls are of single spar construction with chordwise stiffeners.

Redux metal bonding is used extensively in the Britannia to eliminate riveting, spread loads and lighten construction. It is used on leading edge skins, wing ribs, spar webs, pressure bulkheads, tail fin and flying control surfaces.

Top and bottom panels of the Britannia inner wing are built complete with stringers. These then are laid in a boxing jig, where pre-drilled spars and longerons are installed. From the boxing jig, the wing goes to an assembly jig for addition of nacelles, leading and trailing edges. Outer wing is fitted but not mated until later for space reasons.

Nacelles

Nacelles are of monocoque shell structure. In the Britannia 100 series, there is a fireproof steel bulkhead with a steel skin behind it for additional fire protection. Jet pipe trays and tail structure also are of steel. On the Mk. 310 series, all this will be titanium.

Alex Symon, Britannia development manager, notes that the nacelles are mounted so far forward that in effect they are almost pods. The engine is

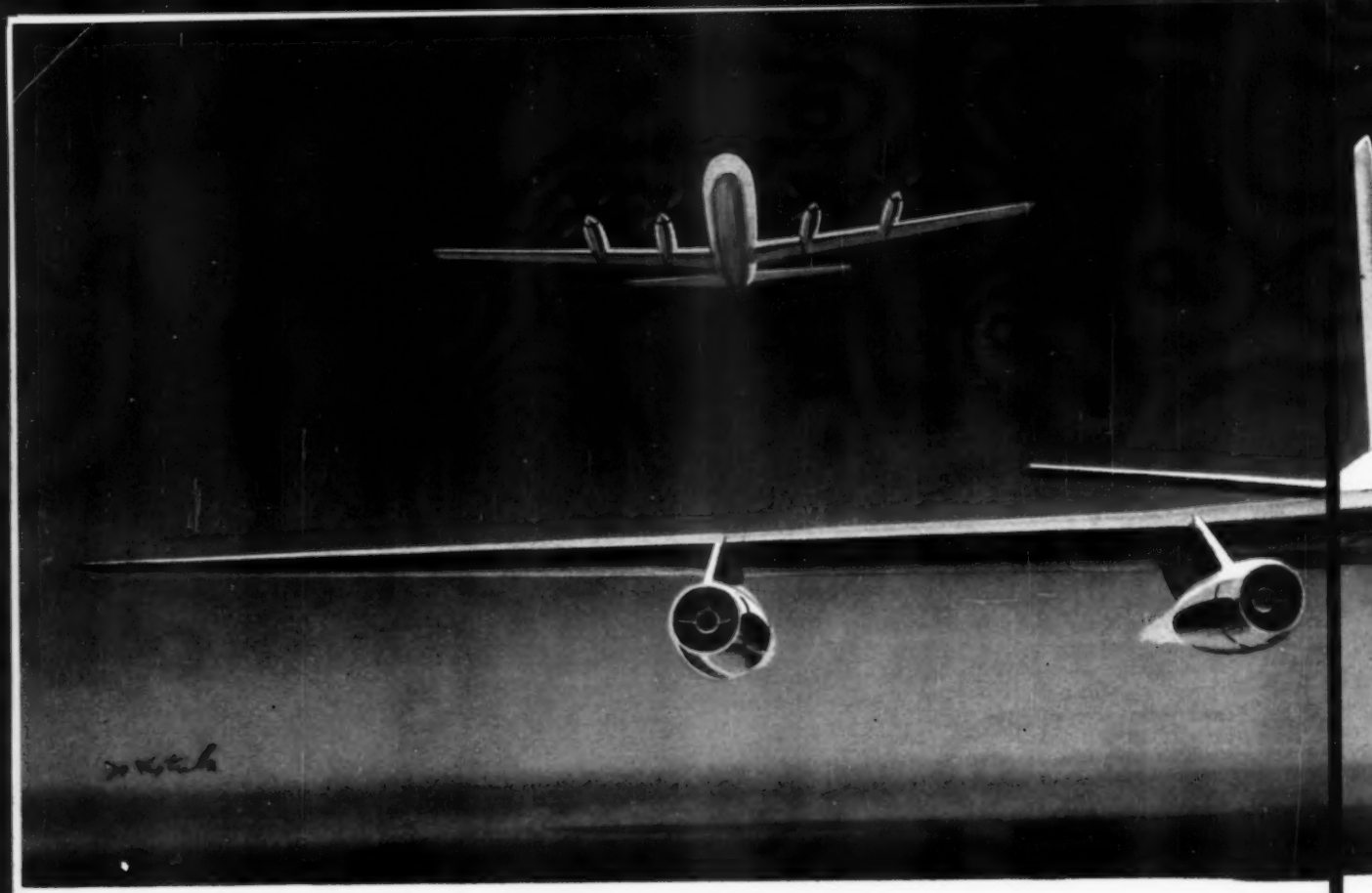
TAKEOFF. With aileron anti-float torsion springs, controls unlock, ailerons droop.

APPROACH. Lift again higher than normal, ailerons rise slightly above neutral.

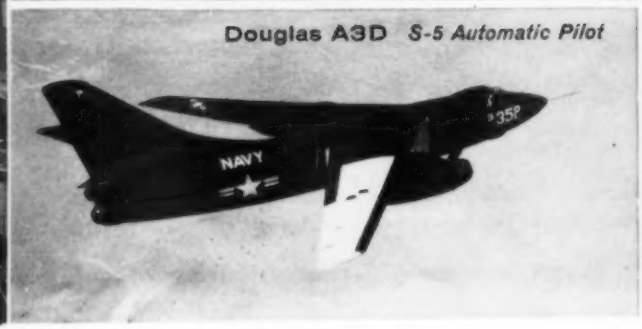
FUSELAGE leaves jig. Segments of hoop-formers are taken away to aid removal.

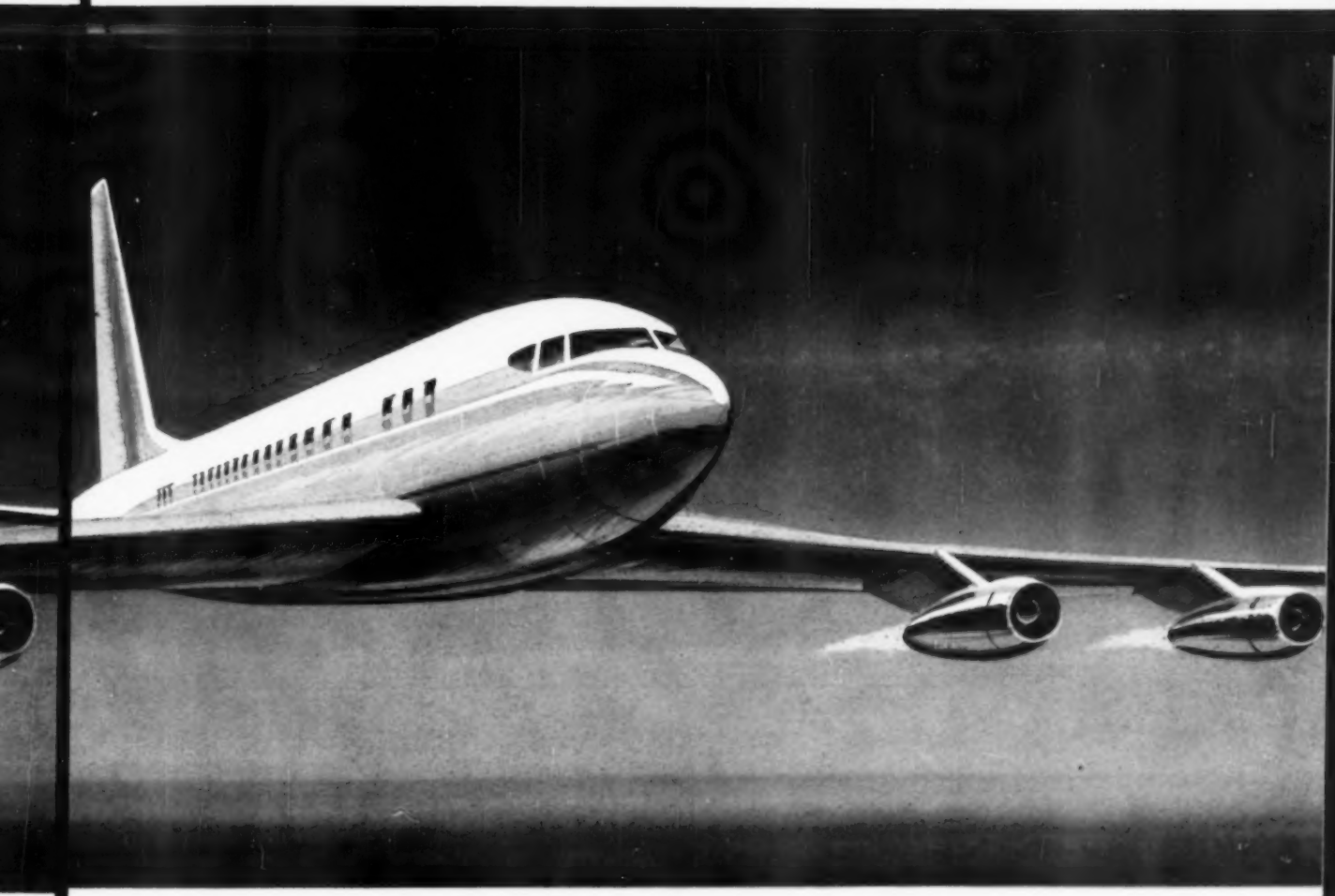
FUSELAGE shows panel construction. Ten panels make fuselage circumference.

FLIGHT DECK provides for crew of four, plus supernumerary seat between pilots if needed.



ANNOUNCING NEW SPERRY





FLIGHT CONTROL SYSTEM

SP-30 designed for new Jet and Turbo-prop Transports

Sperry's experience in designing and building flight control systems for multi-jet aircraft has enabled Sperry engineers to design the new SP-30 Flight Control System to meet the requirements of the airliner of the forthcoming jet age. This system is based on an entirely new concept of flight control.

In 1946 Sperry introduced its now-famous Model A-12 Gyropilot® to the airlines. Since that time, this system has been installed in hundreds of DC-3s, DC-4s, Convairs, Stratocruisers, DC-6Bs and DC-7s, and is in daily use by most of the major airlines.

Later models were designed for many military applications in high-speed jet and turbo-prop aircraft. By working in close cooperation with the military and the design groups of Boeing, Douglas and Lockheed, Sperry developed flight control systems for the B-47, B-52, A3D and the C-130. Thousands of these aircraft are being flown today by these flight control systems.

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well ahead of the main structure. Heavy nacelle shear loads are taken out through front and rear spar frames. Overhang moment is taken out mainly into the skin.

Assembly Schedule

Final assembly of the Britannia goes like this:

1. The port wing is placed in a permanent cradle.
2. The starboard wing and fuselage sections are on movable cradles.
3. The wings are joined to the center rib and the center fuselage is dropped over it. (In the Britannia, wing torsion loads are taken out in the spars and from the wing skins through longerons.)
4. The front fuselage and nose section are attached. The rear fuselage is mated a week later.
5. The belly panel is added, followed by the fillets.
6. The fin goes on next.
7. The aircraft is wheeled away on a dummy undercarriage for later addition of horizontal stabilizers, electrical and hydraulic systems, flaps, flying controls, undercarriage and other items.

In view of this unusual manufacturing method and the extensive subcontracting it makes possible, it is unlikely Bristol ever will set up a U.S.-type assembly line.

Proteus Engine

The Proteus 705 engine which powers the MK. 100 now has more than 56,500 hrs. of bench and flight testing behind it, including 18,000 hrs. of flight time.

More than 100 of the engines have been built and Bristol Aero-Engines Ltd., the Bristol engine subsidiary, reports sufficient production capacity to keep up with airframe demands. The Proteus 755 will have a new reduction gear and greater power.

Overhaul time on the Proteus at present is 350 hrs., but the company hopes to have this up to 450 hrs. by the time the BOAC Britannias go into service in July, and up to 1,000 hrs. within two years.

Bristol believes the free turbine principle of the Proteus engines, in which two turbine stages drive the compressor and two drive the propeller, gives a quietness, economy and flexibility unmatched by fixed ratio turboprops.

Since the turbines are linked only by the gas stream, the pilot can vary his propeller rpm. within fairly wide limits without changing compressor rpm.

It also has the advantage that a windmilling prop creates little drag since it does not have to turn the engine. Bristol's engine-out performance curves, in fact, are based on a wind-milling, not a feathered prop. There is no need for automatic feathering devices.

"The pilot can feather at his leisure

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A few of the typical shapes of metal parts which have been Hydrospun.

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A Cincinnati Hydrospin machine is now in operation at Kaiser Metal Products, Inc., and is available to missile, jet engine and other manufacturers for development and production work.

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Savings Take Many Forms

Forming by this economical method obsoletes many chip cutting operations with resulting savings in labor, material and machines. One manufacturer has made savings of 100 lbs. of critical high temperature alloy in one jet engine part alone. Another development on a missile part shows savings of 40% in material over draw die method and saves weight of the finished part by control of wall thickness.

A wide range of metals has been successfully Hydrospun and, as the above photograph shows, an unlimited variety of tubular, conical and hemispherical shapes is possible. Ask us about ways to put this Hydrospin to work for you in solving your manufacturing problems on hard-to-make, highly stressed parts. We can show you how to produce a better part at a definite cost saving. Write for brochure today. Address Dept. A.

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Design Engineers: Take advantage of controlled wall thickness possible by this process and consider redesign for ultimate strength and weight savings.

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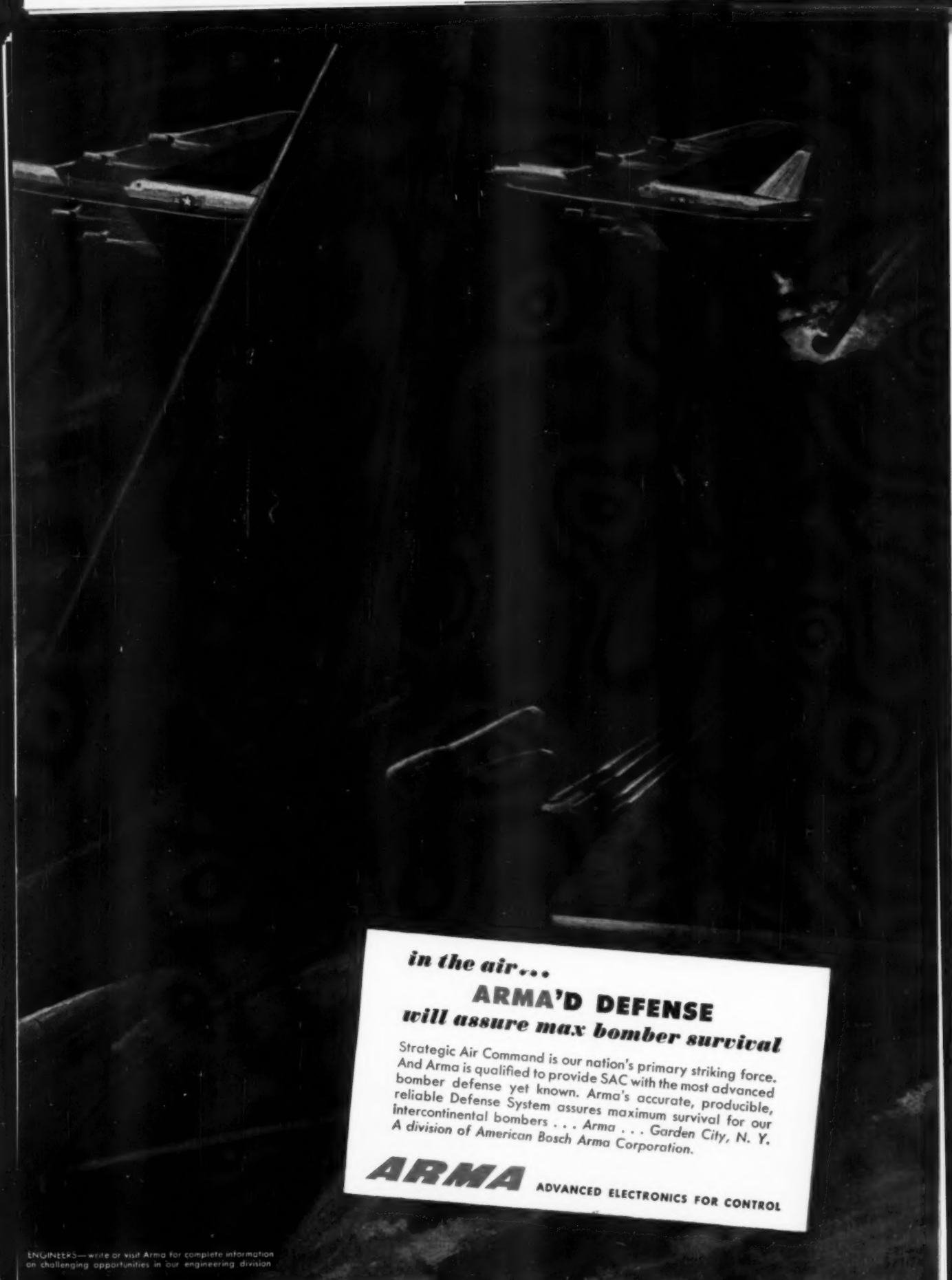
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—after the panic dies down," says Bristol's chief test pilot, Bill Pegg.

Some of the design features of the Britannia are as unique as its engines. Perhaps the most outstanding is the servo-tab control system.

Servo Controls

Development manager Symon says servo controls were chosen to get away from the maintenance problems of a hydraulic power boost system.

Flying controls are completely free-floating surfaces. Left and right elevators or ailerons are not inter-connected. It still is somewhat surprising to see a Britannia taxiing with both ailerons drooping while one elevator is cocked up and the other down. Surfaces true up in trail at about 40 knots.

The control system is based on torsion tubes, which carry only light loads. Three outer tabs on each elevator are connected to the manual controls and the inner tab operates from the trim wheel on the pedestal.

Inner tabs on the ailerons are not connected to the aileron circuit but to the rudder circuit to counter the effect of low tail dihedral. As the pilot applies rudder, the aileron tab is moved to bring the wing up. Artificial feel is built into the circuits.

What is pilot reaction to this system? Pegg has this to say: "I guarantee I can put a pilot in the cockpit and if he doesn't know the control system is different, he won't find out by flying it."

Preflight Checkout

Pre-flight checkout of controls is somewhat different with the servo system. Engine slipstream is sufficiently effective on the tail surfaces for the purpose. But the pilot must take a certain amount for granted regarding his ailerons.

Early flight testing showed a considerable aileron upfloat, particularly at the stall. The reduced maximum lift cut down rolling power and resulted in some wing-drop at the stall. Anti-float springs therefore were installed to preload the ailerons downward. When the control locks are released before flight, the ailerons therefore both go down. The pilot must depend on this to indicate that his ailerons are unlocked.

Pegg says, "I believe we backed the best bet in this type of control."

BOAC's Capt. Rendall reported, that during the tropical trials in Johannesburg, someone remarked: **"If I understand you correctly, the Britannia is a very orthodox airplane except that the controls are not attached to the control surfaces and the propellers are not attached to the engines."**

He might have added that the throttles are not attached to the engines, either. The Britannia is equipped with electric throttles for ease of opera-

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tion and to prevent overspeeding of the turbine engines by heavy-handed pilots.

There has been some wariness among pilots of the device which prevents the engine from speeding up as fast as they can shove the throttle forward, but even with this limitation, the rate still is higher than for a piston engine.

Anti-skid Brakes

Some U.S. airline pilots might show concern over the anti-skid braking system which is standard Britannia equipment but Pegg reports: "You absolutely have to have it with the bogie gear." Bristol now is testing a system which would allow an aircraft to land with its brakes fully locked, taking advantage of the anti-skid device to get maximum braking on every landing.

The Britannia is equipped with reversing propellers.

Undercarriage consists of a four wheel bogie on each side and a twin nose wheel. The bogies turn and fold into the aft portion of the inboard nacelles. The nose wheel folds forward.

Symon says Bristol is looking into a free-fall system for the main gear. This gear is not used as a speed brake. Maximum lowering speed is 175 knots. Main undercarriage fittings are forgings on the aft face of the rear spar.

Windows in the Britannia fuselage are all double glass with each glass designed to carry full pressure. Mk. 100s and early Mk. 300s have magnesium-zirconium frames with the glass bolted to the frame. Later Britannias will use shallow light alloy pressed frames which will be a complete window unit. These will be clamped into position by brackets and will be free of bolt holes.

Interior Freedom

Doors are all inward opening. Three large emergency doors in the aft cabin supplement the fore and aft passenger doors. There also are two over-wing exits on each side of the fuselage. The 12-ft. diameter of the fuselage permits six-abreast seating accommodating as many as 100 passengers. Fuselage is free of structural bulkheads from the cockpit after to the rear pressure bulkhead, allowing great freedom on interior arrangements. Large square cargo compartment extending the length of the lower fuselage is pressurized.

Pressurization tests of the Mk. 100 have been completed and a Mk. 300 now is under test in the company's water tank at Filton. Pressurization of the 100 series is at a pressure differential of 7.25 psi. and later series at 8.30 psi. due to higher operating altitudes, up from 31,500 ft. to 35,000 ft.

All four engines are tapped for the Britannia pressurization but full requirements can still be met with one engine out on each side. No trouble with air contamination has been encountered.

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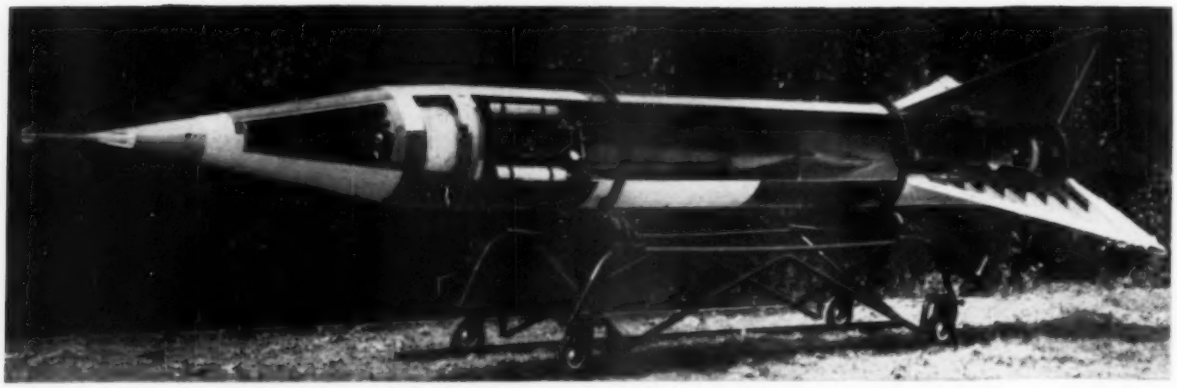


VERONIQUE cutaway shows interior detail and construction of this high-altitude French rocket.

Delta Fin Veronique Aims At 137 Miles

By Frederick I. Ordway, III*

Vernon, France—A ceiling of 137 mi. is the future target for development of the Veronique high-altitude rocket, the largest post-war effort of France and Western Europe.

During the six-year test program with the rocket, the maximum altitude reached has been about 90 mi. The success of the test firings has spurred development of the future model aimed at a higher ceiling.

Early rounds were fired in France, but more recently flights have been made from the government proving grounds in Colomb-Bechar, Algeria.

*Executive Vice President, General Astronautics Corp.

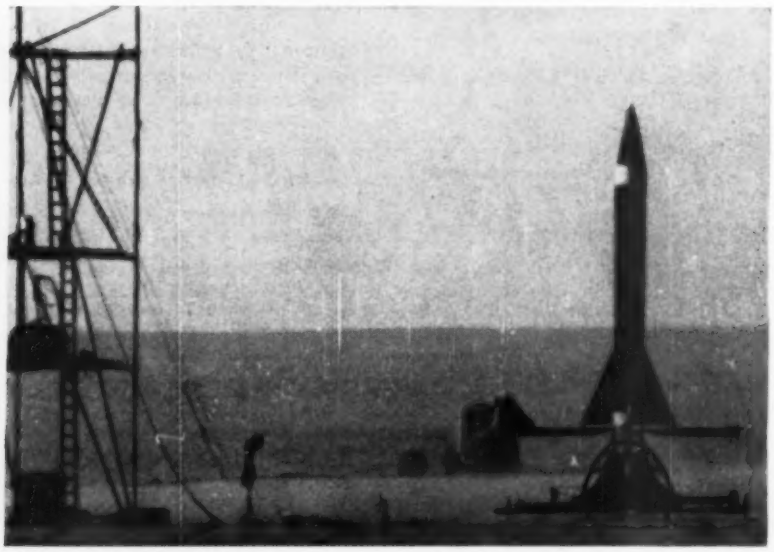
The Veronique originally resembled a German V-2 in general layout, but late models used a changed fin design with delta surfaces replacing the trapezoidal ones of the V-2. Overall height of the rocket is 24 ft., and the diameter is less than two feet. Gross weight is about one and one-half tons.

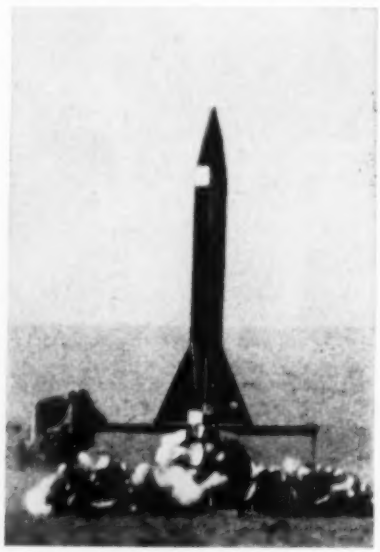
Veronique was developed by the Aerodynamic and Ballistic Research Laboratory in Vernon, part of the Directorate of Armament Research and Fabrication of the Ministry of National Defense.

Stabilizing System

Veronique is a fairly conventional missile save for its guidance, an unusual and simple feature. Four cables uniformly unwind from a drum located under the platform from which the missile is fired. Outriggers extending from the rocket's fins receive these cables and maintain the stability until the missile's upward motion is sufficient to allow aerodynamic forces to effectively act on the control surfaces. Cable cutoff altitude is about 180 feet; from here on, the missile enters a free ballistic trajectory. Clock-controlled explosive bolts eject the outriggers at the proper time.

No precaution need be taken for differing cable tension since all cables unwind from the same drum, which is protected from the blast by jet deflectors. The correct takeoff angle is preset by making two cables a bit shorter than





LAUNCHING VERONIQUE: The rocket, with cable stabilizer attached, stands on its firing table as the motor starts.

the others; it is also possible to incline the launching platform slightly to compensate for wind.

A number of Veronique firings using this technique have been made in Algeria, one of which reached a record altitude of 84 miles, close to the missile's calculated ceiling.

Recovery Techniques

Instrument recovery is made by explosive separation of the nose cone, which is coupled with a drogue and parachute-aided descent. Though this recovery technique is very useful, a majority of the information desired is telemetered to the ground stations. Following initial separation, the nose cone falls toward the earth at about 160 mph. Before impact, a barometric capsule sets off a second series of explosive bolts which initiates parachute descent.

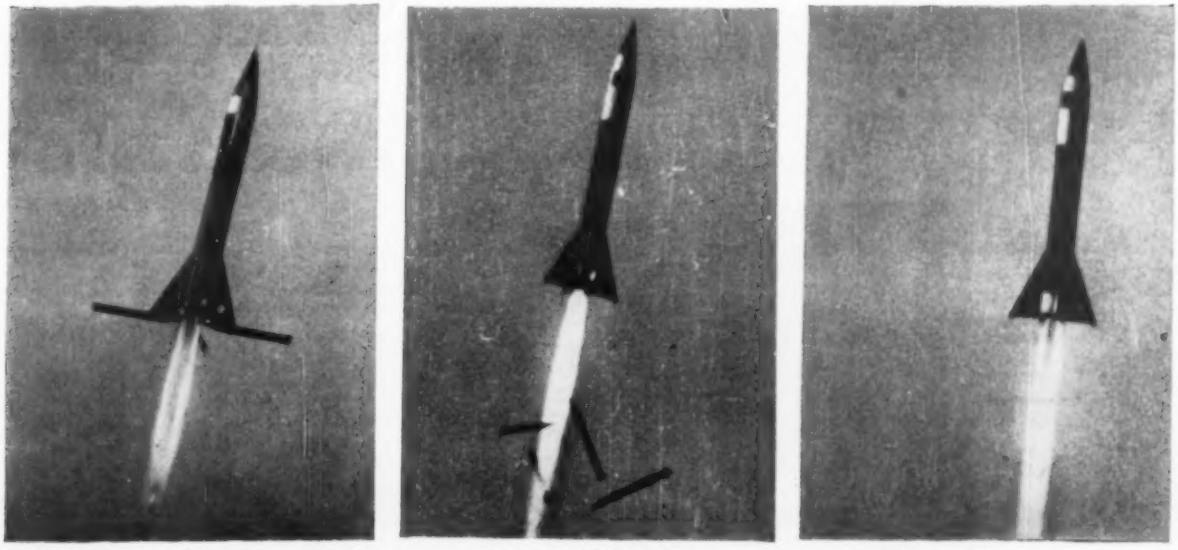
The missile's rocket engine develops nearly 9,000 pounds of thrust burning Diesel oil and white fuming nitric acid, and is fired by a hypergolic igniter using furfuryl alcohol. Some recent tests have employed a turpentine fuel, with a noticeable improvement in specific impulse.

The Veronique dates from 1949, and has recently been somewhat enlarged, thereby permitting a longer firing time.

Data on earlier and later models are presented in the accompanying table, together with tentative figures for a projected future model.

The Veronique firings were composed of the "reduced" series, R-1 to R-8 and the "normal" series, N-1 to NA-15. The early series had short firing times and were used principally to check out starting and cable stabilization techniques. The N group of the second

POWERPLANT of the Veronique gets a pre-flight run on the test stand at Vernon.



OUTRIGGERS carry the guidance cables, break away early in the flight to leave the Veronique unguided for the rest.

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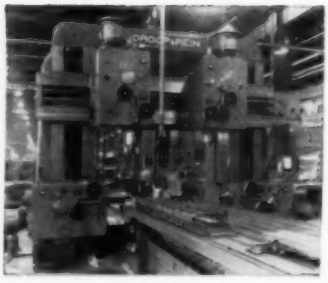

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Performance Data for Veronique Missiles Fired

Missile No.	Firing Site	Date	Takeoff Weight, lb.	Propellant Weight, lb.	Oxidizer	Fuel	Thrust, lb.	Specific Impulse lb lb sec	Range, ft.	Max. Altitude, ft.	Burnout Altitude, ft.	Max. Velocity (ft sec)	Firing Time (sec)	Miscellaneous Remarks
R-1	Suippes	8 2 50	2361	353	WFNA	diesel oil	8820	.....	0	10	.....	.....	.....	Excess pressure at starting
R-2	"	8 4 50	2229	353	"	"	8820	.....	0	26	.....	.....	.....	Excess pressure at starting
R-3	"	10 2 51	2245	353	"	"	.....	.....	0	32-49	.....	.....	.....	Improper closing of the fuel filling connection
R-4	"	10 5 51	2101	353	"	"	9923	.....	3,900	5,970	1,526	558	5 8	Good performance
R-5	"	10 6 51	2101	353	"	"	9702	.....	2,600	5,900	1,640	532	5 9	Good performance
R-6	Le Cardonnet (France)	1 28 52	2225	353	"	Furfuryl alcohol	7938	.....	2,600	3,600	985	472	5	Good performance
R-7	"	1 26 52	2225	353	"	"	7938	.....	4,600	3,600	985	472	5	Good performance
R-8	"	1 30 52	2225	353	"	"	7938	.....	4,100	3,600	985	472	5	Good performance
N-1	North Africa	5 20 52	2425	1455	"	diesel oil	.....	201	26,000	63,300	24,600	1380	29	Broken fin
N-2	"	5 21 52	2425	1455	"	"	.....	201	42,500	45,900	18,000	1150	24	Chamber throat burnout
N-3	"	5 22 52	2425	1455	"	"	.....	201	233,000	196,900	52,500	3510	36	Good performance
N-4	"	11 8 52	2514	1455	"	"	.....	201	82,000	34,450	21,900	2065	32	Unstable combustion; burned injector
N-5	"	11 9 52	2514	1455	"	"	.....	201	1,650	1,595	.....	230	10	Unstable combustion
N-6	"	11 16 52	2514	1544	"	"	.....	201	84,000	1,800	.....	2610	26	Unstable combustion; sprayer burnout (injector)
N-7	"	11 13 52	2514	1455	"	"	7938	201	16,500	12,150	9,850	1350	20	Unstable combustion; sprayer burnout (injector) (explosion)
N-8	"	11 18 52	2514	1455	"	"	7938	201	26,000	.....	23,000	2500	32	Explosion at end of combustion
N-9	"	11 17 52	2514	1455	"	"	7718	201	72,000	32,800	.....	.....	26	Unstable combustion; burned sprayers (injector)
N-10	"	4 21 53	2514	1455	"	"	from 7277 to 4631	198	197,000	147,650	44,950	2960	38	Good performance
N-11	"	4 18 53	2514	1455	"	"	5954 to 4441	198	40,000	10,500	9,200	1310	28	Unstable combustion (?); broken piping
NA-12	"	10 19 54	3175	2234	"	Oil of Turpentine	9041 to 2646	203	443,000	295,000	10,300	4170	55	Good performance
NA-13	"	10 17 54	3175	2234	"	"	6615 to 2867	203	206,000	129,500	49,500	2640	45	Accidental obstruction, prior to firing, of an acid line
NA-14	"	2 21 54	3153	2205	"	"	8820	203	256,000	443,000	100,100	4760	51	Good performance
NA-15	"	2 20 54	3153	2205	"	"	7718 to 3308	203	167,500	95,000	36,100	2300	47	Defective functioning of generator, or leak

series had a design firing time of 32 seconds. Target period of combustion of the NA models was at least 45 seconds.

Launching Techniques

Veronique is easily transported, and its launching base needs only to be a relatively flat surface measuring approximately 20 by 65 feet. A simple, easily set-up launching structure is required. A complete Veronique is calculated to cost a little over $10,000, a full load of propellant adding another $200.

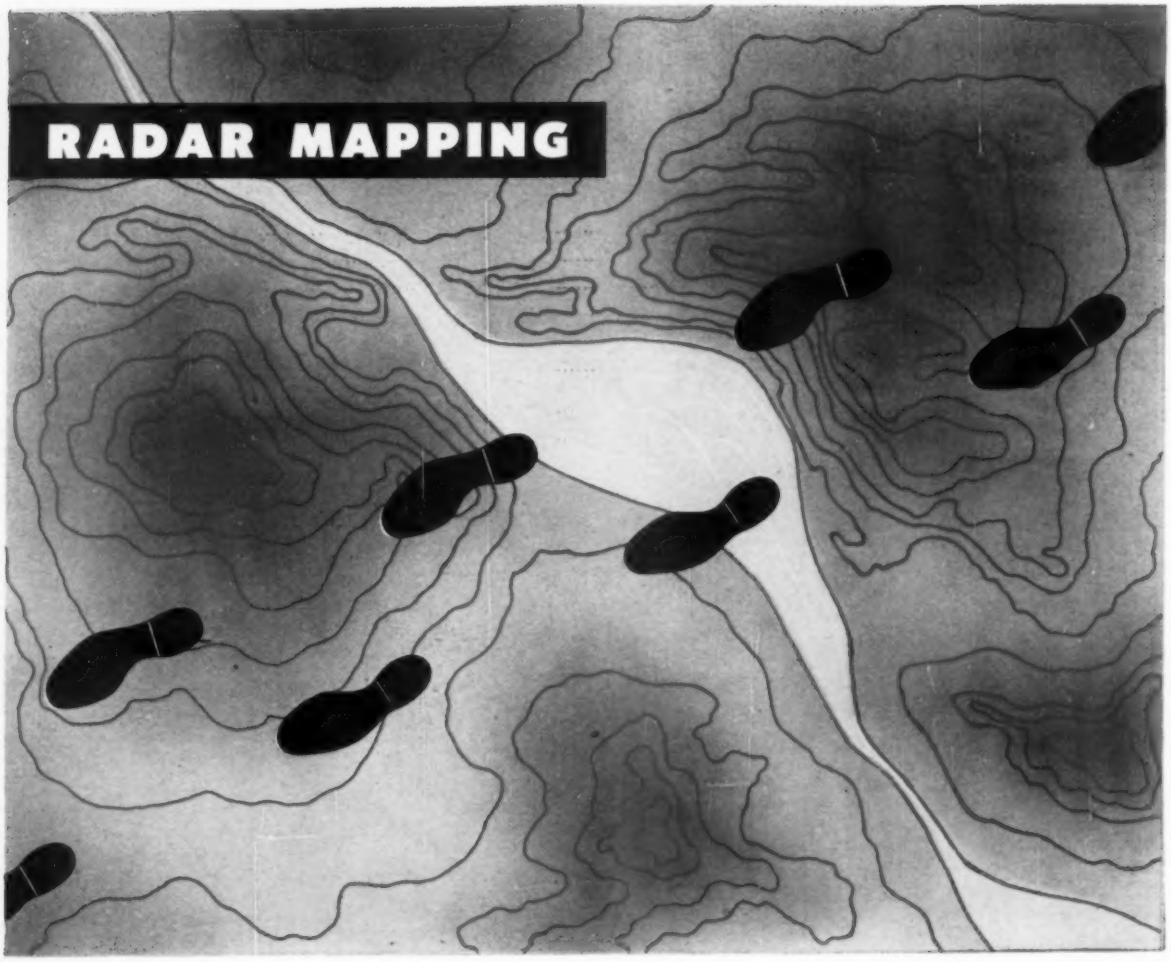
It fits into a special case 18.7x5.9x 5.9 ft. A missile and its accessories can be set up relatively rapidly, requiring a day for unloading, two for setting up, and two more days for making all additional preparations (component checkouts, controls, propellant loading, etc.).

Contrary to previous plans, it does not appear that Veronique rockets will be fired in cooperation with the 1957-58 International Geophysical Year. One reason given is that French participants in the IGY have earmarked the great concentration of available funds on such areas as gravimetry and oceanography, leaving rocket exploration of the upper atmosphere largely to the U. S. and perhaps also to Russia and Britain. There are efforts being made in France to restore government appropriations to rocket participation in the IGY, and the present picture could change.

The Aerodynamic and Ballistic Research Laboratories are located on a flat plateau overlooking the town of Vernon in the department of Eure, one hour train ride west and north from Paris. Vernon is on the Seine river,

THE VERONIQUE MISSILE

ITEM	Type N Early Model	Type NA Late Model	Project Future Model
Length, ft.	21.4	24	24
Diameter, ft.	1.8	1.8	1.8
Loaded Weight, lb.	2,540	3,180	2,980
Propellant Weight, lb.	1,560	2,160	2,160
Payload, lb.	133	133	133
Thrust, lb.	8,820	8,820	8,820
Firing Time, sec.	31.5	45	48.5
Maximum Speed, mph	2,500	3,200	4,000
Acceleration, (max.), g.	7.5	8.2	10.5
Altitude (max.), miles, (attained)	44	84	.....
Ceiling, miles	50	90	137



Cartography IN SEVEN-LEAGUE BOOTS

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not far from Mantes, and is typical of towns in the old Norman province.

The laboratory grounds are completely closed in. Rows of neat houses characterize the residential area of the base. In addition to the principal offices, there are the computer facilities, scientific laboratories, machine shops, test pits, propellant storage facilities, engineering buildings, interior firing ranges and wind tunnels. The laboratory employs about 1000 persons, and is administered by the French Army.

The Laboratoire de Recherches Balistiques et Aerodynamiques was conceived shortly after the war and plans were laid for its construction in 1947. Actual building began towards the end of 1948, and the base went into operation several years later. Besides work in guidance and propulsion, the Laboratory has a very well-equipped Aerodynamics Section, which has been in operation since 1952. Its equipment includes a number of small wind tunnels, a large, closed-circuit, supersonic wind tunnel and a ballistic firing range.

Wind Tunnels

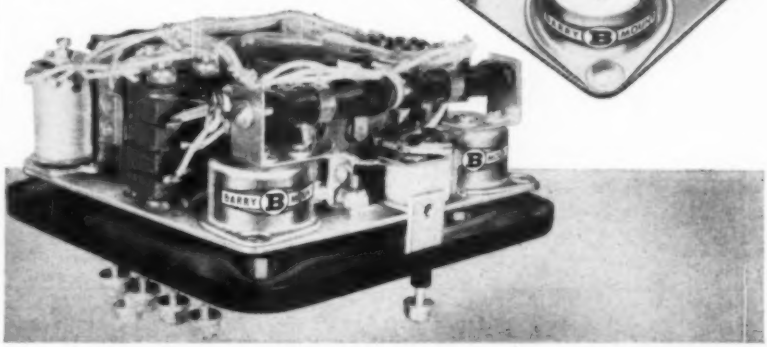
Three small supersonic wind tunnels allow preliminary tests to be made economically. One of them is vertical; small, supersonic shapes can be projected upward, allowing a number of measurements of ballistic behavior to be made. These small wind tunnels have test sections 8 in. square. Vacuum level tanks with a total volume of 12,500 cu. ft. can be emptied of 99% of their air in less than three minutes; 200 hp. pumps are used in this operation. Air is dried upon entering by a silica-gel composition.

The larger tunnel receives its air from two axial blowers which operate either in parallel or in series, and which are driven by 20,000 hp. electric motors. An air-conditioning plant, consisting of vacuum pumps, silica-gel driers and piston compressors, dries the air. Major characteristics include Mach number range from 1.4 to 4.4; test section pressures of 14-160 psi.; and a 16 in. by 16 in. test section. For required Mach numbers, separate nozzle blocks are placed ahead of the test section; changes of nozzles can be made in three minutes. Wind tunnel air temperatures and pressures can be adjusted easily by varying the amount of water introduced to the air coolers, and by adding new, dry air. Full recording instruments are available, data being immediately transferred to a punched card system. The free flight firing range is 365 ft. long, has a 16.4 x 19.7 ft. section, and is equipped with photographic recorders.

Up-to-date electronic computer facilities are also available at Vernon, and both linear and general simulators are

Here's ALL-ANGL Reliability in Minimum Space for JETS and MISSILES

ALL-ANGL Mounts integral with base of relay interlock assembly built by Diaphlex Division of Cook Electric Company for F 86 and F 100.



The attitude gyro of North American Aviation's F-100 Super Sabre must give reliable indication through every flight attitude — or the pilot won't know which way is up.

F-100 Super Sabre photo courtesy of North American Aviation, Inc.

That's why ALL-ANGL Barry Mounts are chosen to protect the delicate sensing relays in the interlock assembly for this vital instrument. Close-tolerance operation in all attitudes demands the certain isolation of vibration — assured by ALL-ANGL Barry Mounts.

Two added advantages result:

1. Size of the unit is cut 40% by integrating ALL-ANGL mounts, upside down, in the base plate.

2. Short leads replace long cables because the Barry Mounts float the assembly within its case.

When your problem is protection through all flight attitudes, your answer is ALL-ANGL Barry Mounts. Write for data sheets giving detailed information. For recommendations on specific problems, call your nearest Barry Sales Representative.

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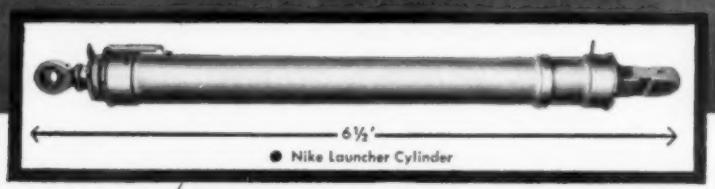
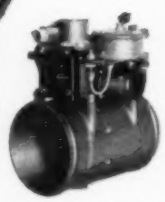
For almost two decades, INTERSTATE has been noted for quality of design, production standards and ability to meet exacting schedules. In the '30's, as one of the largest producers of light aircraft, INTERSTATE played a vital role in the development of America's aviation training program. During World War II, INTERSTATE produced over $50 million worth of material for the Armed Forces, including actuating cylinders that opened the bomb bay doors of the B-29 carrying the atom bomb over Hiroshima. In post war years, INTERSTATE has been a factor in precision aircraft parts manufacturing, as well as in production of airframe components. Today, products from our highly skilled engineering design group are used by every major airline throughout the world.



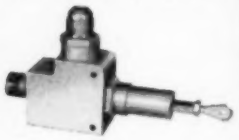
● Nike Launcher Cylinder

● AD-6 Navy Dive Bomber Fuselage

● Hydraulic Door-catch Cylinder



● Ram Air Pressure Regulator



● Pneumatic Canopy Release Valve

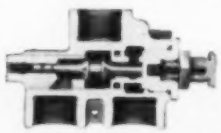
● Pneumatic Anti-G Blackout Valve

● Pneumatic Selector Valve

● Pneumatic Air Valve (rotating)

● Hydraulic Actuating Cylinder

● Hydraulic Fuel-selector Valve



● Hydraulic By-pass Valve

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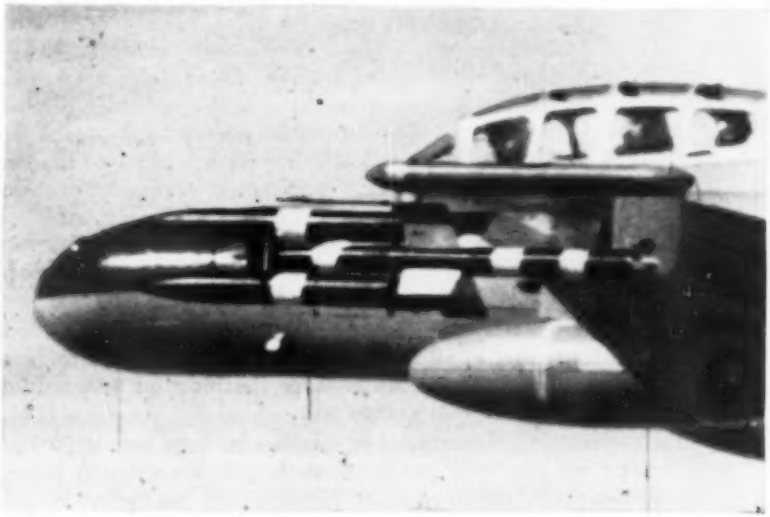
in constant use. The base is well equipped, and is putting forth some of the most important achievements in modern French rocketry.

Though the French missile program is not as imposing as those underway in Russia, Great Britain and the United States, some solid development work is going on in that country. France's present achievements in rocketry reflect a respectable historical background in the field, one that dates to the turn of the century. The rocket-astronautical pioneer, Robert Esnault-Pelterie, author of the famed book *L'Astronautique*, worked during the thirties with the Armament Fabrication Technical Services at St. Cloud, near Paris, and from about 1934 carried on a series of gasoline-ether and liquid oxygen rocket motor experiments.

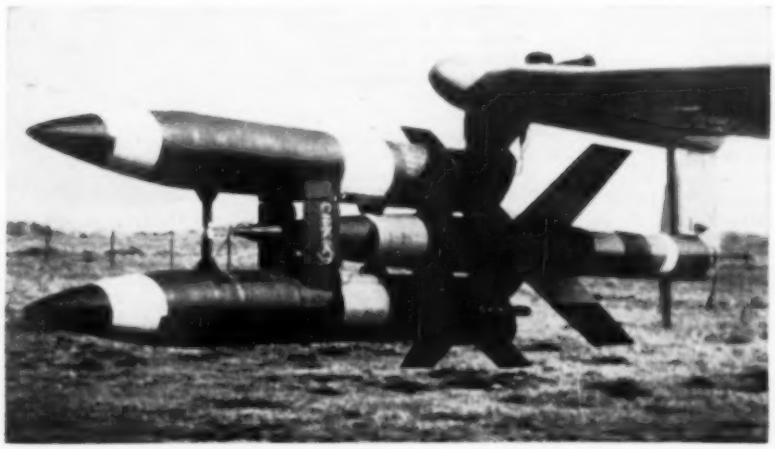
Rougeron did some development work on a rocket bomb, but, like Esnault-Pelterie, was put out of the business of rocketry in World War II. One who was not discouraged by the Germans was Maj. J. J. Barre, who had the temerity to static test an EA-41 rocket, not once, but several times. It was unguided, fin-stabilized, and operated on gasoline-ether and liquid oxygen. As soon as France was liberated, a flight firing of this 10-ft. missile was made near Toulon. It reportedly flew over 35 mi., and built up a thrust of 2,200 pounds for 13 seconds.

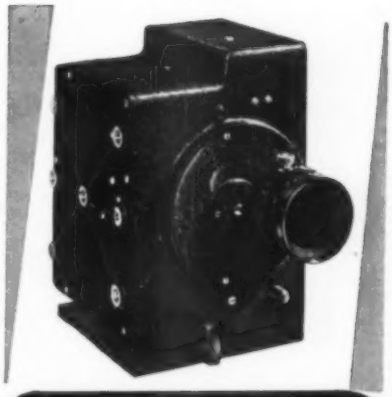
Since then, France has gone in for a variety of weapons, ranging from infantry, air-to-air, surface-to-air, and possibly surface-to-surface missiles, to rocket powered airplanes, and upper atmosphere research vehicles.



Fireflash on Meteor Wingtips

British air-to-air missile, Fireflash, manufactured by Fairey Aviation Co.'s Weapon Division, attached to wing tips of Gloster Meteor is a "coaster." Assembly (below) shows double suspension, one at rear of booster cases, other at rear of missile itself. Fireflash is powered by top and bottom rocket casings which separate after accelerating the missile. Missile contains no power plant of its own and coasts to target.





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A missile's ability to seek out its target—to follow an elusive point in space—is a measure of its "IQ". When a manufacturer of today's advanced performance guided missiles and supersonic aircraft requires this high IQ he specifies **Gyro Dynamics Rate Gyros.** Their **design, reliability** and **accuracy** are planned to meet and surpass the rugged requirement demanded of them. Combining such features as flotation design, torsion bar restraint, and strong mechanical structure; **Gyro Dynamics Rate Gyros** are easily capable of withstanding severe acceleration, vibration and shock.

Available in AC or DC outputs, the AC capable of resolutions up to one part in 10 thousand of full scale output. Uniform damping throughout the full military specification temperature range simplifies control equipment.

Our engineering department is anxious to help you with your difficult gyro job. Why not let us show you the solution with a gyro specifically designed to do tommorrow's job today!

GENERAL SPECIFICATIONS

TEMPERATURE RANGE: −65°F to +210°F standard. (higher temperature available). **DAMPING:** Any value from .2 to 1.0 tol. ±.2 over temp. range. **SHOCK:** up to 60G any axis. **VIBRATION:** up to 50G any axis from 0-2000 CPS. **ACCELERATION:** up to 100G any axis. **MAXIMUM RATE:** from 2°/sec. to 2000°/sec. **MOTORS:** 115 volt, 3 phase; 28 volt, 3 phase; 115 volt and 28 volt, single phase available, also −28 volt DC.

AC TYPE

RESOLUTION: up to 1/1000 max. rate.
LINEARITY: within 1% up to 4 volts. 3% up to 10 volts.
MAX. OUTPUT: any value up to 10 volts.
EXCITATION: any value up to 115 volts single phase.
HYSTERISIS and THRESHOLD: as low as 1/10000 max. rate.

POTENTIOMETER TYPE

RESOLUTION: up to 1/400 max. rate. (800 turns of wire)
LINEARITY: as low as ±1% full scale (Function of resolution and max. rate)
HYSTERISIS: ±1%.
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RESISTANCE VALUE: any value from 1K to 15K.
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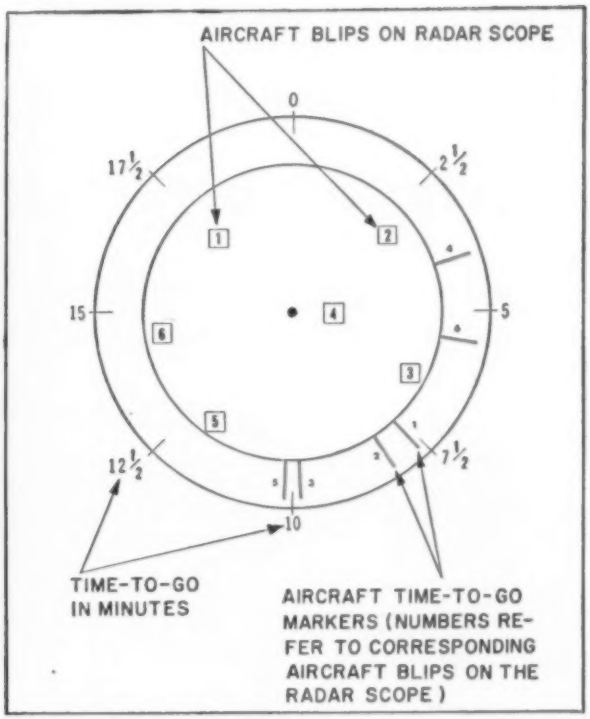

VOLSCAN CONSOLE, part of automatic traffic control equipment. Illustration shows time-to-go markers in relation to radar blips.

Automatic Air Traffic Control Described

By Philip J. Klass

New York—First details on promising Air Force developments and programs in the field of automatic and semi-automatic traffic control equipment were revealed recently by Benjamin F. Greene, Jr., chief of the Air Force Cambridge Research Center Navigation Laboratory.

Known techniques could solve the pressing Common System traffic control problem, but despite the equipment progress, Greene sees little hope for a satisfactory long-range solution. That is, unless all airspace users agree on a national policy which scientifically defines the basic problem and an approach to its solution. Greene emphasized that these opinions were his own, not official Air Force views.

Developments Under Way

Greene said that these developments were under way as part of the USAF integrated TRACALS program (Traffic Control And Landing System) being carried out by the Wright and Rome Air Development Centers and AFCRC:

• **En route traffic** flow computer, designed to schedule automatically the orderly flow of en route traffic much like the Volscan system schedules aircraft approach to an airport. (AW April 23, p. 143.)

• **Digital-type** Volscan scheduling unit, which will be able to compute desired changes in aircraft speed as well as heading. (Present Volscan design relies solely on change of aircraft heading to bring it in at correct time.) New digital version, being developed by the Burroughs Corp., also will have increased scheduling flexibility, provide for both take-offs and landings.

• **Color radar scope** display, which can show aircraft blips in any one of seven colors to indicate aircraft altitude or destination. Color display, being developed by Radio Corporation of America, is slated for delivery later this year.

• **Semi-automatic** traffic manager, a computer-indicator which enables ground controllers to avoid bunching of aircraft as they enter a Volscan controlled area (60-mile radius). Device can be used to smooth flow into airports not equipped with Volscan.

SAGE Limitations

One of the problems, Greene said, which might prevent the application of the air defense radar network and SAGE System to Common System air traffic control, is bunching. Ground radar is most effective, Greene pointed out, when aircraft are widely dispersed. If aircraft are bunched together, as with the present system of airways, one aircraft may obscure another on radar.

Another problem is that two aircraft at different altitudes and ground distances from the radar may have the same slant range (distance from ground radar to airplane measured along a line connecting the two). Thus the two aircraft would appear as nearly coincident blips on the PPI despite considerable actual separation.

Air-Derived Data

Aircraft traffic control transponders, which identify each aircraft blip on the scope and can be used to transmit back to the ground the aircraft's barometric altitude, might ease these problems and make SAGE suitable for Common System use.

But Greene believes there is a definite need to obtain air-derived data on position of aircraft, either as the primary data source or as a back-stop for data obtained from ground radar. Aircraft bearing-distance information obtained from an airborne Tacan or VOR/DME,

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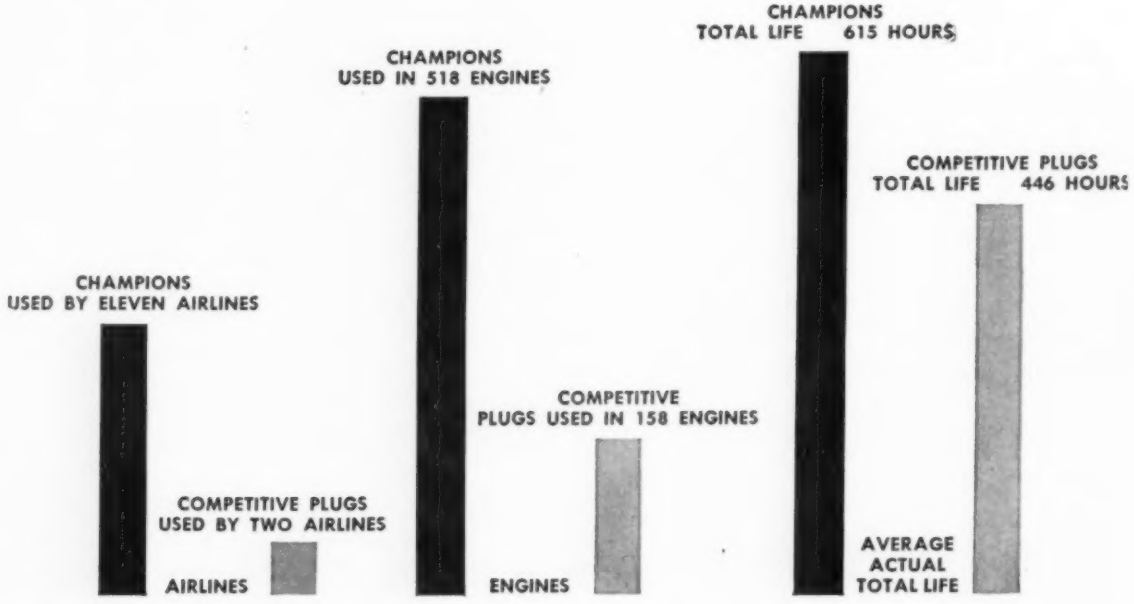
We know how much you respect the experience equipment. Here are the facts . . . supplied by the plugs, both for the demanding turbo-compound

TURBO-COMPOUND ENGINES

Airline	Type	No. Aircraft	Spark Plugs	Engines Using Only Champion	Engines Using Other Plugs
AMERICAN	DC-7	27	Champion	108	....
DELTA C&S	DC-7	10	Champion	40	....
EASTERN	DC-7	9	Other	....	36
	L1049C	16	Other	3*	61
NATIONAL	DC-7	4	Champion	14	2*
NORTHWEST	L1049G	4	Champion	16	....
PAN-AMERICAN (Atlantic Div.)	DC-7	9	Champion	26	10*
TRANS-WORLD	L1049G	20	Champion	80	....
UNITED	DC-7	25	Champion	100	....
KLM	L1049C	12	Other	2*	46
AIR FRANCE	L1049C-G	18	Champion	69	3*
TRANS-CANADA	L1049C	7	Champion	28	....
SEABOARD & WESTERN	L1049D	4	Champion	16	....
LUFTHANSA	L1049C	4	Champion	16	....

*Evaluation Test



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†As determined by survey, September 1, 1955

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Thread Size	Esna No.	#s per C	Esna No.	#s per C	Esna No.	#s per C
4-40 NC-3B	M-40	.14	MJ-40	.05	LHTM-40	.08
6-32 NC-3B	M-62	.26	MJ-62	.09	LHTM-62	.13
8-32 NC-3B	M-82	.42	MJ-82	.16	LHTM-82	.19
10-32 NF-3	M-02	.50	MJ-02	.19	LHTM-02	.25
¼-28 NF-3	E-048	.90	MJ-048	.36	LHTE-048	.39
5/16-24 NF-3	E-054	1.20			LHTE-054	.64

How weight conscious are you?

Weight reduction is a constant goal among aircraft design engineers. Yet, important as weight saving is, when it comes to fasteners there are applications where factors of safety, performance and cost still must influence final design. In your specific fastening problem is lighter weight paramount? Or can you afford a small weight penalty to accomplish a cost savings? Are high temperatures a decisive operating problem?

SOLUTION:

Whatever your design requirements are, the ESNA line includes a fastener to meet them. For instance, there are three basic hex nut types:

A. Lowest in cost are the steel parts with fiber or nylon inserts (Type M), a standard in the industry for over 20 years. These offer by far the widest assortment of sizes, shapes and application possibilities of any self-locking fastener. (Temp. to 250°.)

B. Next in cost *and lightest of any* self-locking hex nut is the blue dyed "J" line of high strength aluminum nuts. They are qualified to meet the same AN requirements as the two steel nuts shown. (Temp. to 250°.)

C. Third is the new ESNA LHTE-TM line of light-weight all steel nuts, suitable for use at temperatures up to 550° F. These nuts have been considerably lightened . . . consistent with safety and performance considerations. *Conforms to AN364 thin nut heights; will meet tensile requirements for full height AN365 parts.*

ESNA can supply the lightest . . . or the most versatile and economical . . . or highest temperature self-locking nuts available. And all of them meet ESNA's rigid quality standards. Select the *right* fastener for your application—and be sure it's an Elastic Stop® nut.

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Please send me the following free fastening information:

☐ Elastic Stop nut Bulletin
☐ Drawings for types M, MJ, LHTM
☐ Here is a drawing of our product. What self-locking fastener would you suggest?

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City_____ Zone____ State_____

plus barometric altitude, can be transmitted back automatically to ground stations by means of a data link system.

Although Greene did not discuss details of the data link techniques, it is known that Tacan includes provisions for data link transmission of aircraft bearing, distance, and altitude back to ground stations. The Air Force has more sophisticated two-way data link systems under development.

Volscan-SAGE Tie-in

AFCRC's Navigation Laboratory, Greene said, expects to install one of the new production prototype Volscans (being produced by Avco Manufacturing) at its Fort Dawes, Mass., facility early next year to see how well it can be integrated with the SAGE system and Boston Air Route Traffic Control Center operations.

Under Air Navigation Development Board sponsorship, AFCRC is installing a 1,200-line closed-circuit television system to investigate feasibility of remoting SAGE radar scope presentations into the Boston ARTC. The 1,200-line resolution, compared to only 525 lines used in commercial TV, is necessary to provide good definition of the very small aircraft identification code letters which appear on the face of the SAGE Charactron-tube radar scopes. (AW Jan. 30, p. 46.)

The Air Force plans to test three prototype Volscan systems at a number of sites. One will be installed at AFCRC, then moved to Clinton

Jet Engine Simulator

Analog computer, designed by General Electric, will enable the company's Aircraft Gas Turbine Dept. to simulate test runs of new jet engine designs, under a wide variety of flight conditions, greatly reducing time and cost of engine development. Designed under Air Research and Development Command sponsorship, the computer uses 6,000 tubes, and covers a floor area of 2,635 sq. ft., making it one of the world's largest analog computers, according to GE.

County Airport near Dayton for operational evaluation. After this it will be returned to AFCRC for SAGE tie-in tests. A second system will go to the Air Proving Ground, Eglin AFB, Fla., after which it will be installed at an Air Defense Command base. The third is scheduled for installation at WADC.

Traffic Manager

In conversations with AVIATION WEEK, Greene said that AFCRC expects to launch a development program for a semi-automatic traffic manager computer which will help traffic controllers schedule the flow of incoming aircraft approaching a Volscan-controlled airport to prevent undue arrival bunching.

The Volscan system is designed to take over traffic flow control at a radius of about 60 miles, but if a number of aircraft enter the control area simultaneously some will have to be delayed. This uses up valuable airspace near the airport. Greene and his co-workers believe it is better to take that delay farther out.

Here is how the new device would operate. When an aircraft approaching the airport is picked up by the ground radar 120 miles away, a tracking amplifier will be assigned to follow it automatically. At the same time, a computer will calculate automatically and continuously how long it will take the aircraft to reach the 60-mile Volscan control radius.

Each airplane position will be indicated on a radar scope by an identifying number. Around the periphery of the scope will be another indicator which will display in minutes the interval remaining for each aircraft to reach the Volscan 60-mile control radius. (See sketch, p. 65.)

Any bunching of time-to-go markers around the periphery of the scope instantly warns the ground controller to space out the aircraft.

The same device could be used in airports not equipped with Volscan by setting the computer to calculate time-to-go to the approach gate of the airport.

Greene says that AFCRC expects to let contracts for several prototype models when Fiscal 1957 funds become available.

Past Mistakes

In Greene's opinion, present air traffic control problems stem from four basic shortcomings in aviation policy:

• **Waiting** for the ultimate system. Too many airspace users have been reluctant to put present techniques and equipment to work in the expectation that a better system is just around the corner.

• **Insufficient effort** devoted to problem. Greene believes the U. S. is using only one-tenth the number of research and development people and half the operational people required by the magnitude of the problem. "We have to pay for a solution to the traffic control problem with men and facilities," he said.

• **Failure to see** problem as a whole. The air traffic control problem involves the airframe, power plant, airport location, and weather consideration, not just avionic equipment. "Every time we crowd in another airport without considering its traffic control implications, we complicate the solution," Greene warned.

• **Inadequate knowledge** of the problem. There have been numerous studies of flaws in present techniques, but these can lead only to patches on patches. What are needed, Greene believes, are scientific analyses and controlled experiments using actual aircraft and systems. Only in this way can we find how accurate navigation data must be, whether area control is preferable to airways control, and the relative merits of ground-derived navigation systems versus airborne.

"We have the techniques today," Greene said, "which can solve almost any traffic control problem—if we can only define it."

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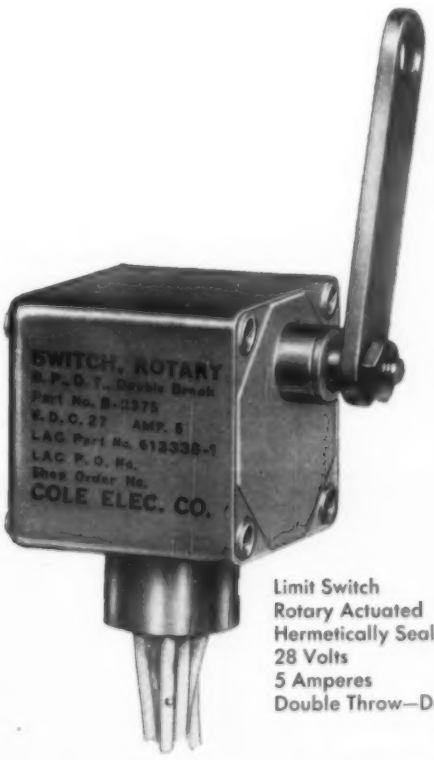

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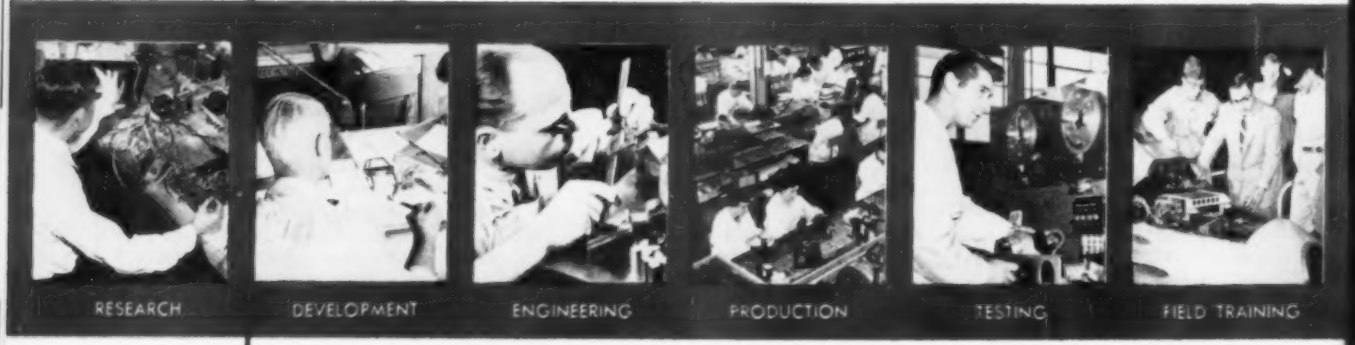

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Longer Hours, Better Firm Use Would Speed Avionics Progress

Dayton—Longer hours for engineers, better use of medium-sized companies and painstaking management control were some recommendations for speeding avionics research and development made last week at the National Conference on Aeronautical Electronics.

A seven-man panel of Air Force and industry representatives had these suggestions for the military:

• **Expand state-of-the-art** research and development in components, techniques and technical understanding—Robert J. Shank, vice president of Hughes Aircraft Co. Shank also said the military should recognize the inevitability of design changes.

• **Make better use** of medium-sized avionics companies with specialized know-how by modifying some present weapon system procurement practices — Dr. Cledo Brunetti, director of engineering, research and development for the Mechanical Division of General Mills.

• **Adopt more flexible** research policies to give industry's researchers greater freedom of approach in solving problems, with less rigid timetables and without requiring delivery of an end product—Dr. Douglas H. Ewing, vice president in charge of Radio Corporation of America's David Sarnoff Research Laboratories.

For Industry

There were these recommendations for industry improvement:

• **Painstaking management control** and thorough planning by industry on each R&D project—Brig. Gen. Victor Haugen, deputy commander for development, Wright Air Development Center.

• **"Don't put too** many men on a job" —William H. C. Higgins, director of military electronics, Bell Telephone Laboratories. Higgins warned that too many engineers on a job can lead to the exploration of too many different avenues of approach.

• **Longer working hours** for engineers and scientists, possibly up to 48 hours a week—Thomas Meloy, president of Melpar, Inc. Meloy said this could provide up to 20% more manpower immediately with no greater cost per hour.

NACA for Avionics?

One of the most novel suggestions, raised in a question from a member of the audience, was the possibility of setting up a basic research organization in electronics operated by the government and patterned after the present National Advisory Committee for Aeronautics (NACA).

In a similar vein, Dr. Ewing suggested that it might be desirable to set up a central agency for all military services which would support long-range basic research. This agency would sponsor research which "is genuinely basic . . . which discovers or explains new phenomena . . . whose uses may not be immediately apparent . . . (but) without which we cannot progress very far in the future."

Failure to put sufficient effort into state-of-the-art developments, as differentiated from those car-marked for a specific weapon, can be a major cause of delays in weapon system development, Shank pointed out.

"A system committed to development at a technical level where the state-of-the-art cannot support it may undergo a long and painful process of trying to drag the state-of-the-art along, with great detriment to the program, the budget, and an individual or company's reputation," Shank said.

Changes are Certain

On the other hand, if a new system does not fully exploit the state-of-the-art, it risks early obsolescence or it may just not do the job, he said.

"Dollars invested in improving the state-of-the-art appear to be the most productive dollars we can spend," Shank said. "At the present time, they are hard to come by until they can be attached to some specific system development project."

Present military requirements are so difficult and the systems to meet them so complex, that even the best development planning cannot put an equipment into the production-application phase without running the almost certain risk of many changes, Shank cautioned.

Changes need not be catastrophic and they need not disrupt either manufacturing or service maintenance organizations, if companies will gear their operations to the inevitability of changes, he said.

The scientific talent and capability of several hundred medium-size avionics companies are not being put to most effective use because of "growing pain" type problems associated with the Air Force's weapon system management concept, Brunetti said.

"A large percentage of the medium-size companies (1,000 to 10,000 employes), unsure of their role in the procurement picture, find themselves attempting to emulate the large com-

New HF Antenna

New type of HF antenna, an insulated probe (arrow), is mounted atop the vertical tail of the Boeing 707 prototype. It is being evaluated as a possible replacement for the isolated tail-cap type of flush antenna. Recently installed Lear L-10 autopilot also is under evaluation. Preliminary tests indicate the probe antenna is electrically as well as aerodynamically superior to conventional antennas.

EXHAUSTIVE TESTS on the General Electric T58 turboshaft engine have been conducted to prove its basic design and to assure top performance and reliability. Results show that the advanced design features of the T58 promise vastly improved helicopter performance.
GENERAL ELECTRIC

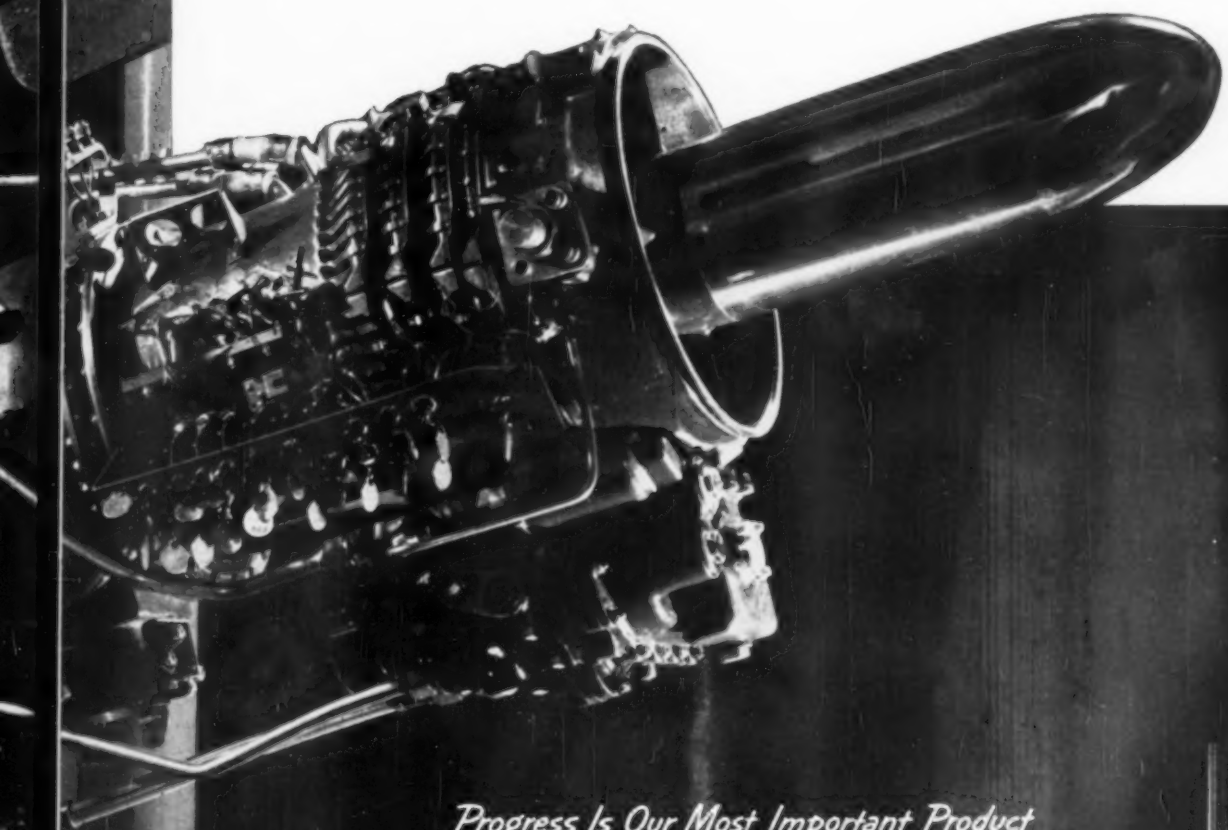
Tests on G.E.'s New T58 Engine Point to Major Advance in Helicopter Flight

General Electric's T58 turboshaft engine, now on test for the U.S. Navy Bureau of Aeronautics, represents a significant step forward in the art of small aircraft gas turbine design.

Incorporating many advanced engine-design features, the T58 introduces to the 1000-horsepower class a turboshaft engine with **low specific fuel consumption** and an **outstanding power-to-weight ratio**—advantages that truly forecast greater helicopter and fixed-wing aircraft performance.

The T58 also introduces a new concept in **constant-speed control** that provides a standard of operation unapproached till now. Designed to take full advantage of a free power turbine, this new control permits operation of the helicopter's rotor at its maximum efficiency and eliminates the need for speed adjustment by the pilot during normal helicopter operation.

These are only a few of the features that make the T58 the ideal helicopter powerplant and another example of General Electric's ability to design and build for tomorrow's aviation needs. With fifteen years of experience in producing aircraft gas turbines of the highest reliability and quality, G.E. continues to set such standards as proof of its role in the progress of American aviation. Section 233-1, General Electric Co., Schenectady 5, N. Y.



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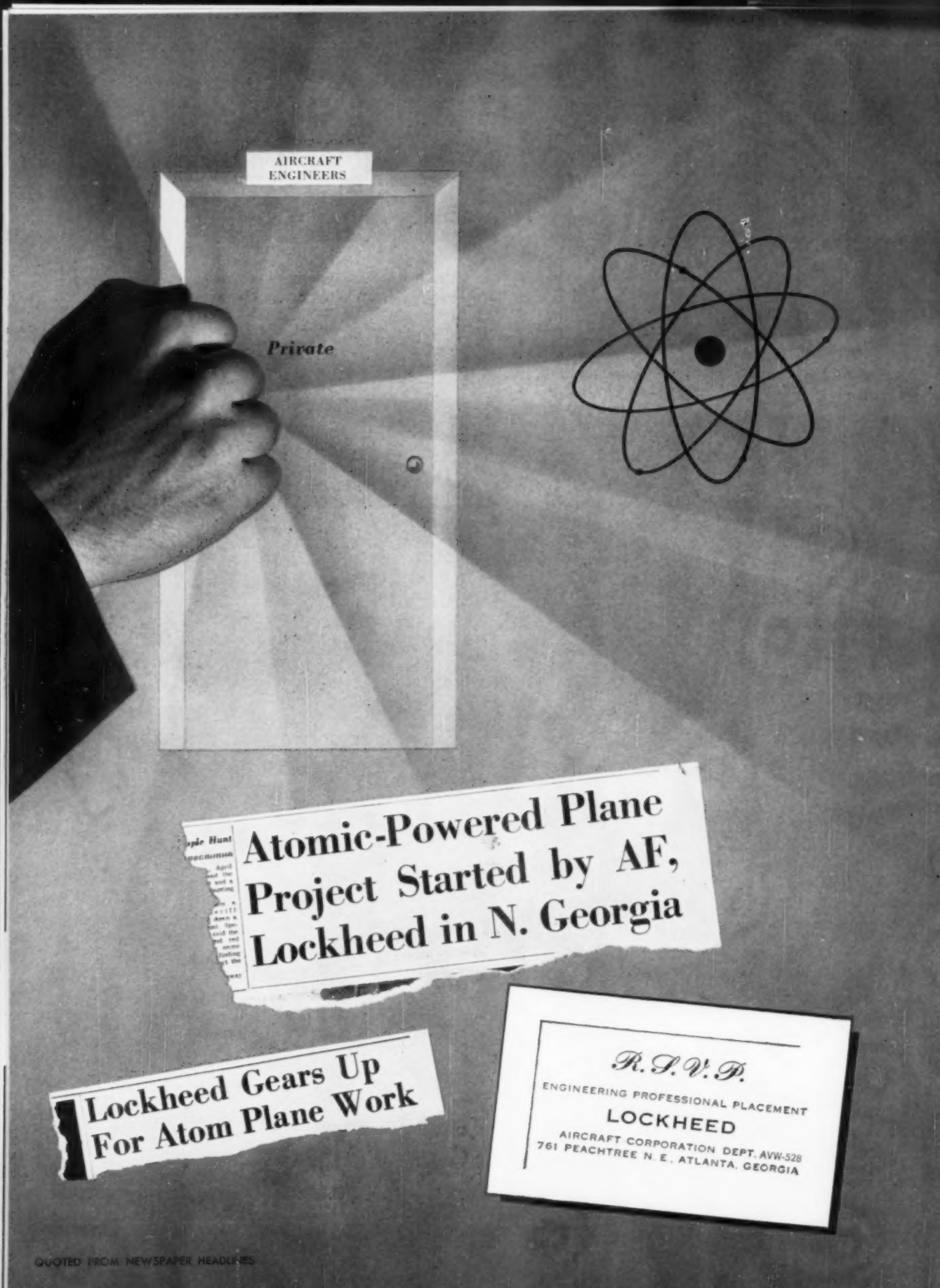
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panics, going after the large contracts, bidding on more things than they should, and running up the list of competitive bidders to the point where it is a major chore for the government to give fair consideration to all in selecting the winner.

"This spinning of wheels represents a large effective loss of manpower and facilities to a military program. It uses up money which might better be put to exploring new solutions to our research and development problems."

Brunetti recommended a two-pronged program to make better use of medium-size company know-how:

• **Ease the requirement** that a prime weapon system contractor be capable of handling as much as 60% of a job within its own organization. This requirement now encourages large companies to further expand the scope of their operations, frequently into a field where their competence is not up to that available from sub-contractors.

• **Redirect activities** of medium-sized firms so that they become sub-system specialists in fire control inertial guidance, infra-red, etc.

"Most medium-sized companies would be happy to be relieved of bidding on large systems projects for which they are not completely qualified," Brunetti said. "They could then place more real effort on technical proposals to the government or prime contractor if they knew that a careful pre-selection (of qualified firms) had been made and they had perhaps as much as a 20% chance of success with each bid."

Brunetti made a plea for bringing in sub-system contractors during the original study phase of a weapon system, in order that they may contribute their ideas to possible solutions. However, to conserve the nation's scientific manpower, he suggested that more discretion be used in selecting the "sub-contractors invited to the party. It is painful for a smaller organization to be on a development and later learn that its idea was fine but it can't have the job because it has never built that type of hardware before."

Melpar's Meloy said that much scientific effort is wasted in duplicating developments underway elsewhere because of lack of knowledge of their existence.

He proposed an electronic deformation faculty be set up which would collect and correlate the result of all R&D projects. Such information could then be made available upon request by individual companies—within the framework of security regulations.

Personnel Shifts

NCA's Ewing urged that research-type projects be funded for more than the present one-year period. Pointing out that many research programs cover broad areas involving a variety of sciences, Ewing said that a company is reluctant to shift and align personnel to a new military research project when there is the possibility that it will be abandoned at the end of a year.

Ewing also urged the military set up a small fund which might be called: "For targets of opportunity." Such funds could be used to support any promising line of research which turns up unexpectedly, without having to wait up to 18 months until new fiscal funds become available. The projects would be moved out of the "targets of opportunity" category as soon as regular funds became available.

USAF Methods

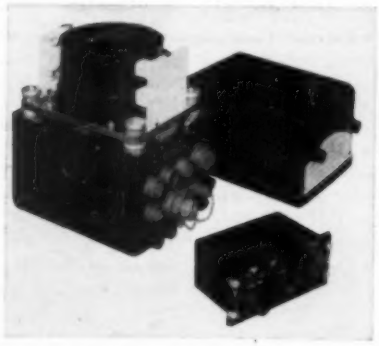
Brig. Gen. Haugen cited these steps which the Air Force is taking to step up the efficiency of its R&D efforts:

• **Technical symposia** and Technical Program Planning Documents released to selected to selected contractors are being employed to give industry advance information on Air Force plans and future requirements. The program will be expanded with the release of documents to other companies as they are cleared. With this information, USAF hopes that industry and science will take a "more active part in our exploratory development program and will support more of it from within your own resources," Gen. Haugen said.

• **Search for streamlined** procedures by which USAF can approve contractor's efforts. "The objective is to hold the contractor responsible for the engineering required to accomplish the development he has contracted for and to provide him with the authority to execute this responsibility," Gen. Haugen said.

Signal Corps Radar

Aircraft traffic radar display, developed for Army Signal Corps, shows each airplane under surveillance together with a three-digit identification number, a velocity vector which indicates its heading and approximate speed, and an array of coded dots for indicating airplane height or other pertinent data. The console, developed by American Machine & Foundry Co., employs a Convair Charactron tube. It is designed to accept such data as aircraft height, identification from automatic source or manual input.



Low Drift Gyro-Compass

New Lear low-drift gyro-compass, Navy Type MA-1, for use on Grumman F11F-1, and other Navy aircraft, has random drift rate of less than 4 deg./hr., uses silicon transistors and magnetic amplifiers throughout, and weighs only 16.7 lb. MA-1 can be operated as magnetically slaved gyro or as a "free gyro" at high latitudes. Developed under Bureau of Aeronautics sponsorship, the MA-1 is being produced at Lear's Grand Rapids, Mich. plant.

This radar wave-guide throat section is cast of aluminum by the Antioch Process*. The specifications are rigid, but we meet them in production. Sample: center walls only .032" thick—inside finish meets electrical specifications as-cast.

The piece weighs 20 pounds and stands a foot and one-half high. Bean specializes in casting wave-guide, impellers and other parts of aluminum to demanding standards. Write for the Bean portfolio of difficult casting case histories. Or send a part print for recommendations.

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*Technical literature about the Antioch Process will be sent on request.

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FILTER CENTER

▶ **RCA Employees Study**—More than 1,475 employees of Radio Corporation of America are taking college courses outside working hours under a company tuition loan and refund plan. Under the plan, which cost RCA nearly $170,000 last year, employees may borrow money to pay tuition for college courses which will add to their education. If they complete them successfully, RCA refunds the tuition.

▶ **Badly Needed**—Sylvania's Waltham (Mass.) Laboratories are studying "new radar techniques which may revolutionize existing methods of detecting aircraft or missiles," as well as electronic devices which can be operated despite exposure to nuclear radiation.

▶ **Unusual Twist**—The Sperry Gyroscope Company Engineers Association (a union) recently ran a large display ad in the New York Times, alongside "engineers wanted" ads. The association cited the advantages of working for Sperry where "these advantages and many more are guaranteed you by a legal contract." The Sperry Engineers Association, whose relations with the company have not always been harmonious, is affiliated with the Engineers and Scientists of America.

▶ **RTCA Meeting**—"Future Use of the Airspace" is the theme of the Spring Assembly of the Radio Technical Commission for Aeronautics, June 5-6, Hotel Statler, Boston. Papers scheduled for the RTCA meeting include:

• **Inertial Guidance**—a report on new developments and their possible Common System application by Dr. Walter Wrigley, Massachusetts Institute of Technology.

• **Doppler Navigation**—recently developed Doppler radar techniques which hold promise for Common System use, by R. C. Sanders, Jr., president, Sanders Associates, Inc.

• **Operational Applications of SAGE**—Dr. George E. Valley, Jr., associate director of MIT's Lincoln Laboratory will discuss possible use of SAGE for Common System traffic control.

▶ **Inertial Guidance Addition**—To AVIATION WEEK's list of U. S. manufacturers of inertial guidance systems and major sub-systems (AW Jan. 23, p. 76) should be added the name of White-Rodgers Electric Co., St. Louis. Company reportedly flight tested a complete inertial guidance system in 1954, and expects to test more advanced systems soon. White-Rodgers also has supplied stabilized platforms to several inertial systems manufacturers.

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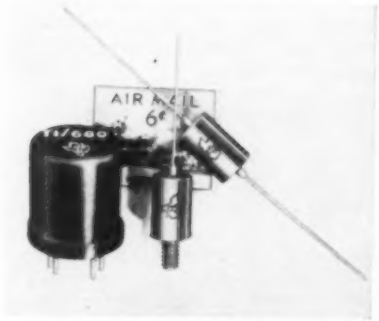
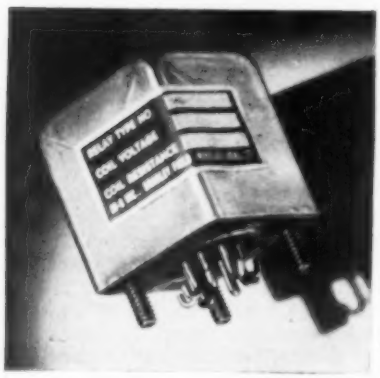


and 1N543A have axial leads; 1N544 and 1N544A have stud-mounting provisions for maximum heat dissipation. Model TI/680 comes in plug-in case making it suitable for replacing a JAN 6X4 rectifier tube. Texas Instruments Co., 6000 Lemmon Ave., Dallas 9.

• **High temperature subminiature pot,** type X-500, measures ¼ in. dia., can be operated over temperature range of −55C to 150C. Unit is available with resistances of 200 to 250,000 ohms, 2% linearity, 0.3% resolution. Pot weighs ¼ oz., reportedly meets JAN and MIL-E-5272A specs. Ace Electronics Associates, 103 Dover St., Somerville 44, Mass.

• **Subminiature relay,** hermetically sealed, measures 1 x 1 x ⅝ in. (high) and reportedly meets MIL-R-5757C. Unit, which can operate up to 125C, has contacts rated for 2 amps at 28 v.d.c. or 115 v.a.c. Relay comes in Form A, B, or C contact arrangement, with maximum of two poles. Operating



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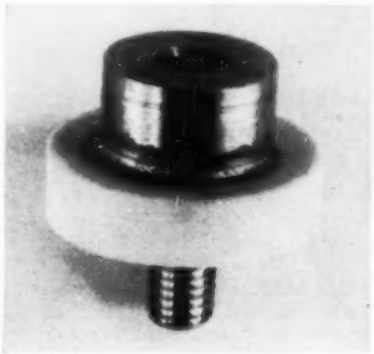
coil resistance ranges from 50 to 10,000 ohms and unit is available with internally mounted silicon rectifiers for a.c. operation. HI-G, Inc., Bradley Field, Windsor Locks, Conn.

• **Sensitive relay,** Series R, operates on as little as ¼ watt coil power and has transit time as low as 3½ milliseconds. Contacts are rated 1¼ amps at 200 v.d.c. or a.c. Pull in and drop out values are adjustable. Unit comes in SPST, DPDT or in a tandem arrangement consisting of two relays on single base. Coil is designed for 30 v.d.c. operation. Radar Relay, Inc., 2120 Pontius Ave., Los Angeles 25, Calif.

• **Silicon rectifier ceramic mount,** which insulates rectifier to permit its use at high potentials above ground, also provides more efficient heat conduction, allowing operation at higher current



levels. Ceramic mounts can be supplied with threads to accept any standard semiconductor power diode. Raytheon Manufacturing Co., Ceramic Sales, Waltham 54, Mass.

• **Subminiature 3-watt resistor,** axial lead, wire-wound, vitreous-enamel covered, measuring only ¼ in. dia. x ⅝ in. long, is now available in resistance values of 1 to 10,000 ohms. Bulletin No. 147-B gives application data. Ohmite Manufacturing Co., 3677 Howard St., Skokie, Ill.

• **Short servo motor,** Type 2V-3362, measures only ½ in. long x 1 in. dia., but is nearly as powerful as a larger size 10 servo motor, according to manufacturer. New motor has one third the torque of a size 10, but only one half the rotor inertia, giving a torque-to-inertia ratio comparable to the size 10. John Oster Manufacturing Co., Avionic Div., Racine, Wisc.

• **Precision potentiometer,** multi-turn, has linearity of 0.005% by virtue of novel design which employs a mechanized "Kelvin-Varley circuit" which gives a continuous, precisely linear voltage division, making use of matched

resistors instead of a helical coil. Unit, called DiPot, is available in 5 or 10-turn models, with a special servo model which allows 180 degree over-travel at each end. DiPot measures 2 in. dia. x 2¼ in. long. Design details are contained in Pub 2-56-A. Servonics, Inc., 834 No. Henry St., Alexandria, Va.

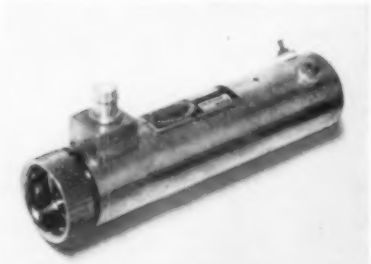
Microwave Devices

• **Broadband microwave absorbers,** for use in radar free-space rooms or outdoor ranges, reflect less than 2% of the incident energy. Material, which comes in rigid foam blocks, does not burn or

absorb moisture, according to manufacturer. Material comes in three types, depending upon frequency range to be covered. Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.

• **Standard gain horns,** in 10 sizes for bands in the 1,170 to 40,000 mc. region, constructed of one-piece cast aluminum, have a gain of approximately 16½ db. at center frequency. Gain varies approximately 3 db. over the band. Half power beam widths are approximately the same in the "E" and "H" planes. The Narda Corp., Mineola, L. I., N. Y.

• **Beacon cavity oscillator,** Model 193, a co-axial line cavity oscillator using the Sylvania UHF Planar Triode tube, provides a stable rf pulse signal source, over frequency range of 2.5 to 4.0 kmc.,



with a tuning range of 200 mc. Peak output is 200 watts, with peak voltage from 1,200 to 1,500. Unit weighs 14 oz., measures 5½ in. dia. x 1 5/8 in. Amerac, Inc., 116 Topsfield Road, Wenham, Mass.

• **X-band reference cavities,** Series MA-318, require no matching and are avail-

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Tomorrow, we promise newer and even better breakers because — aircraft circuit breakers have always been our business.
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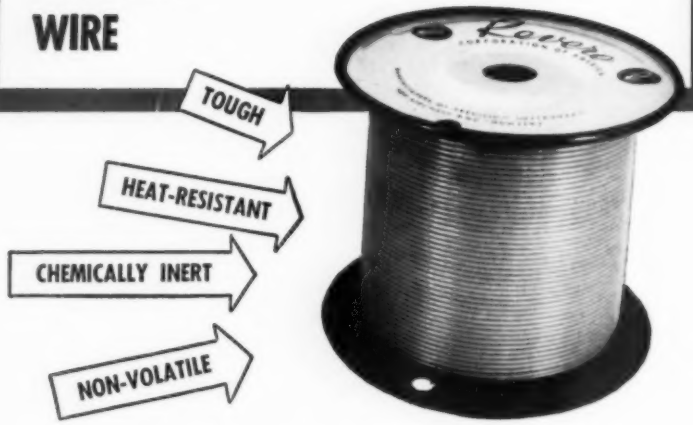
REVERE

Revcothene*

INSULATED

WIRE



Because of its extreme toughness, high heat resistance, and chemical inertness, Revcothene insulated wire is widely recommended for hermetically sealed equipment . . . for devices operating with small gauge wire at high temperatures . . . and for conditions where corrosion is a problem.

Revcothene is silver-plated copper wire with an extruded coating of monochlorotrifluoroethylene. Even at 150° C. (302° F.) the insulation is inert . . . with no volatile lacquers or plasticizers to ruin contacts. Revcothene withstands abrasion and flexing, and resists such corrosives as ozone, acids, alkalis and petroleum products.

Available in eight standard sizes from 28 to 10 gauge . . . in 15 colors. Flexible strandings, copper or silver braid shielding, heavy wall insulation and jacketing can also be furnished. Multiple-conductor cables are also available.

Revcothene is only one of many insulated wire and thermocouple wire products made to exacting specifications by Revere Corporation of America. Technical design assistance gladly offered. Write today.

TYPICAL SPECIFICATIONS — 22-Gauge Revcothene Wire

Spark Test Voltage	7500
Insulation Resistance	1000 megohms/1000'
Operating Temperatures:	
Flexing Application	—40° C. to 135° C.
Non-Flexing Application	—65° C. to 150° C.
Flammability	Does not support combustion
Operating Voltage	1000 volts
Water Absorption	0.00
Effect of Acids & Alkalis	Generally unaffected
Cold Flow (Compressive Strength)	32,000 PSI
Abrasion Resistance (MIL-T-5438)	Passes 36"-400 grit aluminum oxide with 0.3 pound weight

* Revere's tradename for monochlorotrifluoroethylene

Revere CORPORATION OF AMERICA 2

WALLINGFORD, CONNECTICUT A subsidiary of Neptune Meter Company

able for fixed frequencies from 9,250 to 9,350 mc.

Units, approximately half the size of their predecessors, are constructed for airborne use. Manufacturer also announces mixer and video cartridge type silicon diodes in convenient reversible assemblies to eliminate stocking of diodes with both forward and reverse direction polarities. The new IN415 and IN416 series is interchangeable with the IN23 and IN21 series of forward and reverse diodes, respectively. Microwave Associates, Inc., 22 Cummington St., Boston, Mass.

Laboratory Equipment

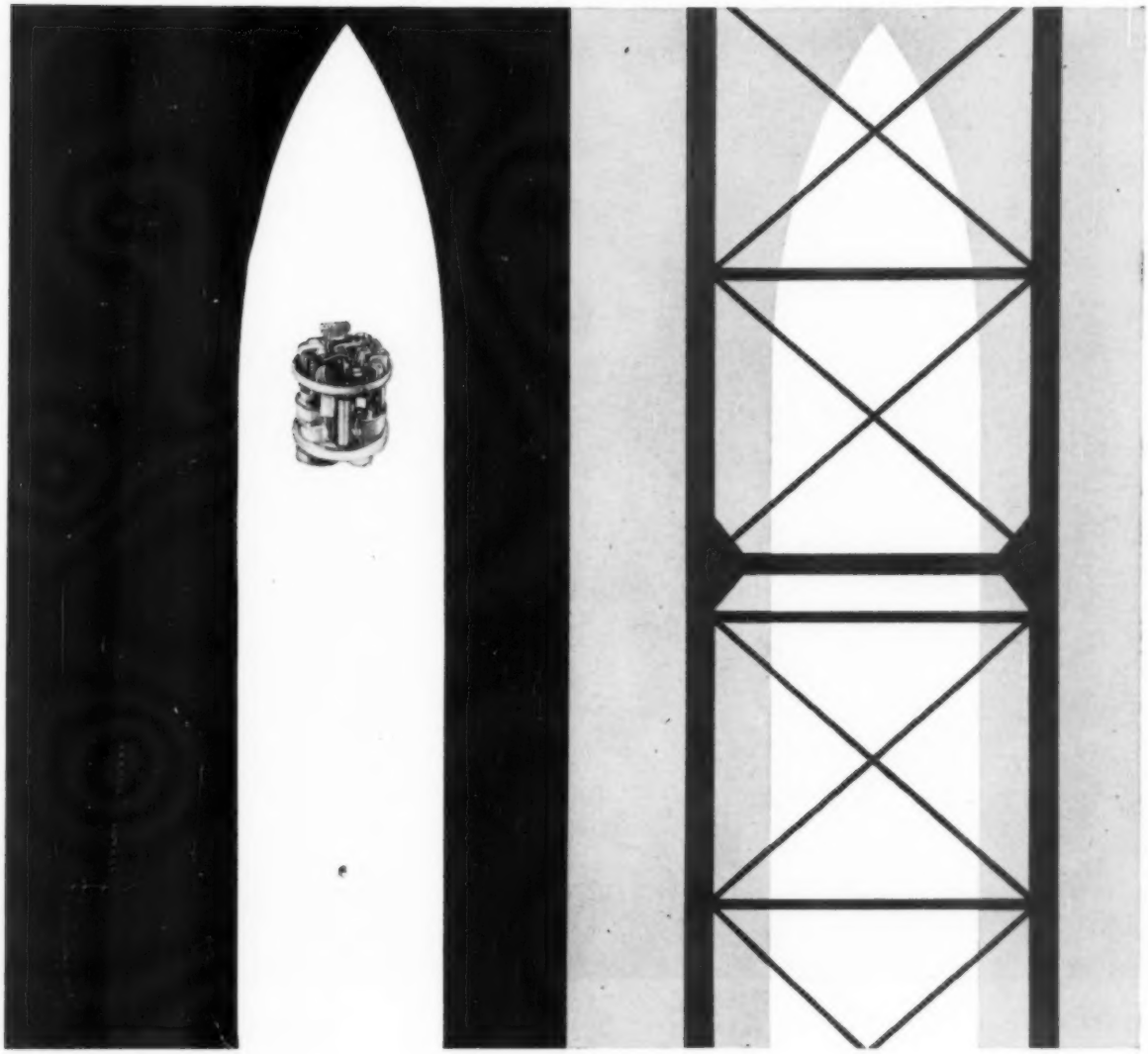
• **Spectrum generator,** secondary frequency standard, Model 1232B, produces crystal-controlled spectrum of harmonically related frequencies, in increments of 1, 2, 5, 10, 50, and 100 kc. over the range of 1 kc. to 1,000 mc. Accuracy is quoted at one part per million, short term, or 0.0005% absolute during any 24-hour period. Amplitude is uniform within 1% over any 1 mc. range.

Servo Corporation of America, 2020 Jericho Turnpike, New Hyde Park, L. I., N. Y.

• **UHF impulse generator,** Model IG-118, produces pulses flat within ½ db. over band of 100 to 1,000 mc., or up to 40,000 mc. in a special model. Maximum peak power output is 9,000 microvolts per mc. of bandwidth. Output is continuously adjustable over a 20 db. range. Pulse width is 0.00005 microseconds, and repetition rate is continuously adjustable from 2½ to 2,500 cycles per second. Catalog G-356 gives further details. Empire Devices Products Corp., 38-15 Bell Blvd., Bayside 61, N. Y.

Datamation On Wheels

A mobile data reduction laboratory-on-wheels, built by Benson-Lehner Corp., Los Angeles, for USAF's Wright Air Development Center, houses 10 data processing machines and a complete film processing laboratory.



From sensitive components to brawny launchers . . .

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● "Precisioneering" power supplies for electronic control systems and developing complex launchers are two of AMF's *many* important contributions to our nation's missile programs ● Today, AMF plays a part in *more than half the missile programs now under way* ● And its activities cover practically every stage of design, development, and production . . . including mechanical, hydraulic, pneumatic and electronic test equipment . . . auxiliary power supplies . . . field and depot handling equipment . . . launchers . . . ground and flight control systems ● See for yourself why AMF's experience in missiles, as well as in a host of other fields, has made it the "can do" company.

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- *Ballistics*
- *Radar Antennae*
- *Guided Missile Support Equipment*
- *Auxiliary Power Supplies*
- *Control Systems*

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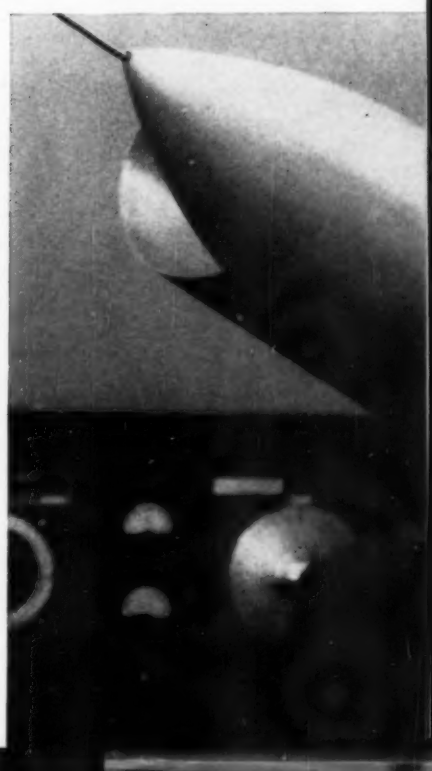
Defense Products Group
AMERICAN MACHINE & FOUNDRY COMPANY
1101 North Royal Street, Alexandria, Va.

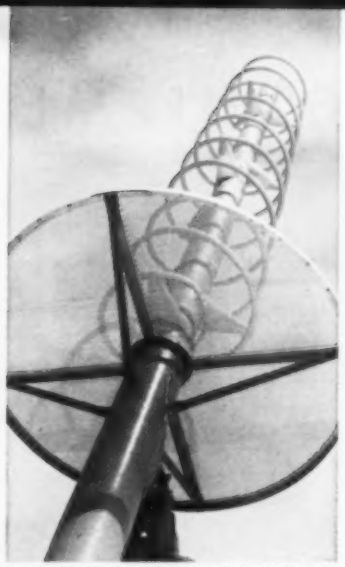
Lockheed Scientists– a new type of bird-man

Pioneer bird-men risked their lives to prove that man could fly. Today's bird-men are the scientists who dedicate their lives to research in the field of missiles (fantastic new "birds" which challenge the imagination) and to the development of the complex missile systems, so important to our defense efforts. Their work is secret, exciting and second to none in military importance—because America's supremacy in aerial weapons faces a menacing challenge.

Lockheed is helping the U.S. armed forces meet that challenge by the rapid expansion of its Missile Systems Division. At Van Nuys, California, a staff of over 3,000 workers is already deeply engaged in top-secret projects for the Air Force. Two new missile research laboratory buildings are being constructed by Lockheed on a 22-acre site in Stanford University's industrial park area at Palo Alto, California. And nearby, on a 275-acre site at Sunnyvale, Lockheed is building extensive engineering and manufacturing facilities.

Everyone at Lockheed's Missile Systems Division is working with a sense of deep urgency to help the nation retain its superiority in missile systems technology—and thus deter attack from any potential aggressor.





A VITAL PHASE of successful missile systems research and development is the testing of vehicles and components under actual operating conditions. This helical antenna (above) receives telemetered data transmitted from test missiles.

(AT LEFT) DR. LOUIS N. RIDENOUR, first Chief Scientist of the U.S. Air Force (1950-51), now Research Director of Lockheed Missile Systems Division, shown with a senior scientist and a student-scientist* discussing simulated trajectory of a high-altitude ballistic missile. Lockheed's advanced research programs include: conditions bearing on flight into space, chemical propulsion systems, power applications of nuclear energy, physical studies of environments created by radioactivity, advanced studies of applications of electronic phenomena, new principles in the remote guidance field, and others.

(BELOW) A DEMONSTRATION MODEL, used to illustrate the fundamentals of telemetering systems. Many advanced contributions in this field, as well as in the fields of guidance control and data reduction, have been made by Lockheed's Missile Systems Division.

(ABOVE) SCIENTISTS at Missile Systems Division using cold-flow test chamber to obtain data on flow rate of liquid fuels at the extreme temperatures which might be encountered by a supersonic, high-altitude missile in flight.

(ABOVE) The speed-up construction program now under way at Palo Alto will permit use of Lockheed's new research laboratories by the start of the fall semester at Stanford University.

**Lockheed's Advanced Study Program helps outstanding students, while employed, achieve MS degrees in Mathematics, Electrical and Mechanical Engineering, Aeronautics and other Physical Sciences. Write: Lockheed Missile Systems Division, Van Nuys, California.*

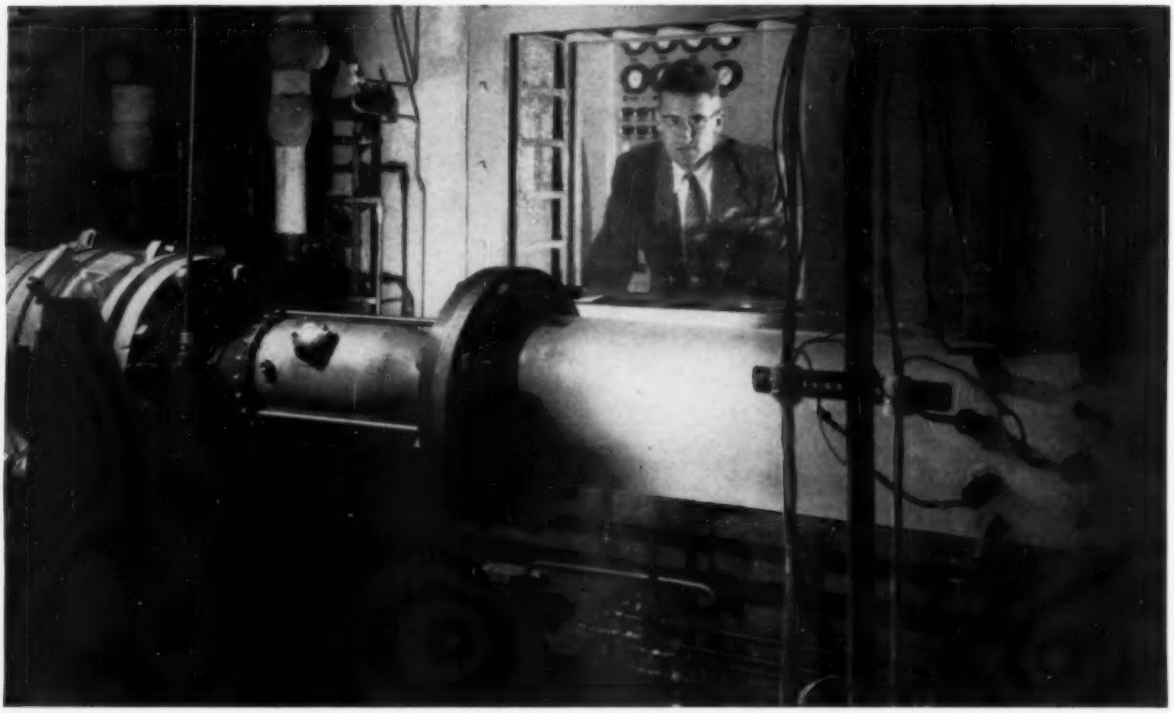
Lockheed

MISSILE SYSTEMS DIVISION

Van Nuys, Palo Alto, Sunnyvale, Calif.

LOCKHEED AIRCRAFT CORPORATION

LOOK TO LOCKHEED FOR LEADERSHIP



TEST RUN of a Dart combustor (between heavy flanges) under way at Texaco laboratory. Note quartz observation window in combustor.

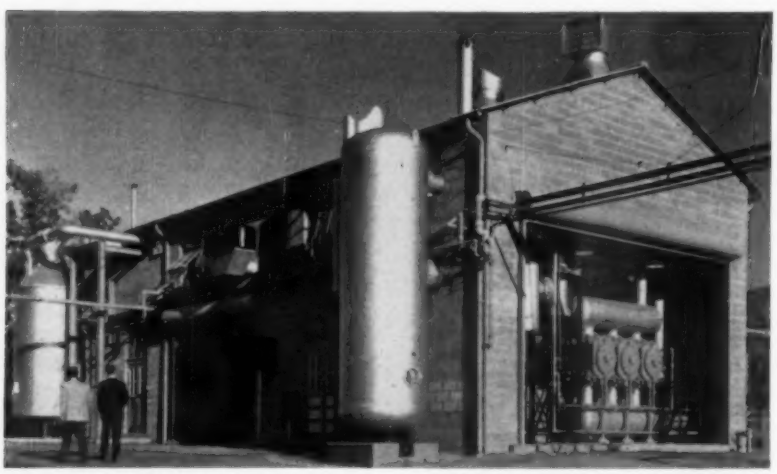
Kerosene, JP-4 Compete in Laboratory

By George L. Christian

Beacon, N. Y.—A comparative test program between aviation kerosene and JP-4 jet fuel at the Texas Company's Jet Fuels Laboratory here indicates there is no significant performance difference between the two fuels. This is only a preliminary conclusion since the tests are far from complete.

The evaluation is being conducted in cooperation with a commercial airline.

That JP-4 has so far performed favorably alongside kerosene is significant from a petroleum supplier's point of view, a Beacon Laboratory engineer told AVIATION WEEK.



JET FUELS LABORATORY building includes a 3,000,000 Btu./hr. air heater (tank at left), surge tank (center) and 1,000-hp. air compressor (seen through open end of building).

"We can make," he said, "a lot more JP-4 than aviation kerosene out of a barrel of crude oil. Our refineries are geared to produce large quantities of high distillates—gasoline and JP-4 type fuels. Concentration on JP-4 as a primary product would throw our refineries a lot less out of kilter than if they had to concentrate on a middle distillate, kerosene, for example, as a primary product.

Gasoline Fate

"If kerosene were to become a primary product and gasoline consumption were to decrease as kerosene consumption increased, disposing of large quantities of gasoline would pose a major problem. This situation might easily occur if planes and then cars switch to kerosene-burning engines. Furthermore, gasoline prices might become de-

Billion Gallon Demand

Commercial airlines alone will require 1.1-billion gallons of turbine fuel a year by 1962, estimates Dr. Wayne E. Kuhn, General Manager of Texaco's research and technical department.

pressed considerably below that of kerosene."

Current JP-4 and kerosene prices are competitive, Texaco says, though rates vary with local supply conditions.

To the operator, JP-4 has the advantage of:

- **Compatibility** with engine design. All gas turbine engines built in this country have been designed to use JP-4.
- **Lower freezing** point than kerosene—a −76F for JP-4 compared to about −40F for kerosene. (Freezing point of kerosene can be lowered considerably below −40F by using specially selected crudes, but this restricts quantity and at the same time raises prices.
- **Less danger** at high altitudes, JP-4 being more volatile than kerosene. Fuel/air ratio in tanks usually is too rich to be ignitable under the low atmospheric pressure of high altitudes.

Kerosene has its advantages. Fire progression rate is lower than JP-4. Also, because U. S. fuel taxes are based on constituents, not end use, kerosene is not subject to the 2 cents a gallon applicable to gasoline and JP-4, a virtue appreciated by the airlines.

Complicating Trend

The increasing trend among gas turbine designers towards higher compressor pressure ratios is complicating the life of Texaco technicians. (Pressure ratio is the ratio of pressures at the compressor outlet and inlet. It is independent of altitude and varies only with compressor rotational speed and design.)

The greatly increased air flows inherent in engine compressors, especially with twin-spool designs which have boosted pressure ratios from the usual values of 5 to 7:1 to 13-1, demand such large power increases to supply the air that the requirements in power and equipment are becoming prohibitive.

Corollaries of high pressure ratios are increasing combustion pressures, which have jumped from 100 in./hg. to 400-500 in./hg., and combustion inlet temperatures, which have soared from 400-500F to 800-F and over.

Deposits are Back

Research engineers at the laboratory are working on two contemporary problems, deposits and radiation.

- **Deposits** when jet engines first were designed, combustion chamber deposits were an early source of trouble. Temporarily a solution was found, but higher combustion chamber through-puts and more complex multi-stage turbines have brought them back on stage.

Blowing off combustion chamber walls and into turbine blading, these deposits can cause severe damage. (In single-stage turbines they blow off combustion chamber walls periodically, but have been ground up by the turbine and exhausted without damage.)

- **Radiation** the increasing temperatures generated in jet engine combustors, ranging to 3,500-4,000F, have made it important to keep heat radiated from the burning fuel to a minimum.

Texaco scientists say that some researchers attribute fuel radiation to the incandescence of carbon particles in the fuel. The fewer the particles, the less the radiation.

"Our problem," Beacon Laboratory technicians say, "is to transfer all the chemical energy possible from the fuel to the air stream in a jet engine's combustors with a minimum of radiation on the combustor walls . . . we want to heat the fuel without its having a glowing effect . . . this is just the reverse that occurs in a typical house heating furnace."

Major Decision

A major decision, taken by Texaco officials while planning the original laboratory in 1947, was to install full-scale test equipment—large size compressors, vacuum pumps, heaters and coolers—to test jet engine burners. Thus Texaco technicians were not forced to use small-scale, bench-type burners to test fuels, which eliminated the complicated and sometimes almost impossible task of correctly correlating various small-scale test data to full-scale gas turbine operation.

As a result, Texaco researchers currently can simulate the problems of jet engine manufacturers. The kerosene JP-4 tests, for example, are being conducted with a combustor from a Rolls-Royce Dart engine—the Vickers Viscount turboprop.

Laboratory Equipment

Equipment Texaco has installed to simulate the high pressures, altitudes and temperatures associated with high speed jet flight includes:

- **Air compressors** with a total capacity of 1,800 hp. Largest is a 1,000 hp., six-cylinder Cooper-Bessemer unit which can be readily phased for one-, two- or three-stage operation.
- **Air heater** fired by gas, which can generate up to 3,000,000 Btu./hr., pre-heats air pumped to the test stand to a maximum of 800F.
- **Fuel pumps** which deliver fuel to the test stand with pressures up to 1,000 psi.
- **Silencers** to quiet the noise made by equipment being tested and by the lab machinery.

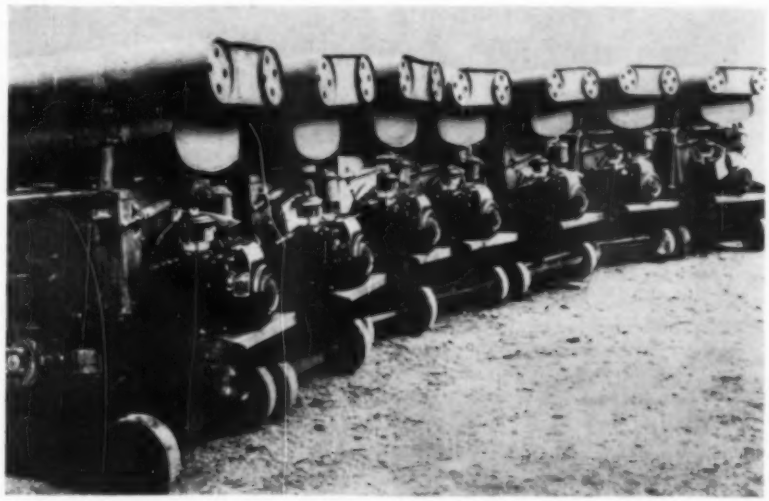
Texaco started working on jet engine fuel evaluation in 1945 in cooperation

Equal Heat

Comparative heat contents of JP-4 and aviation kerosene, are:

JP-4 . . . . . 18,564 Btu./lb.
Aviation kerosene . . 18,492 Btu./lb.

This compares with 18,700 Btu./lb. for aviation gasoline with octane ratings of 80, 91 and 100 and 18,900 Btu./lb. for avgas of 115-145 octane rating.

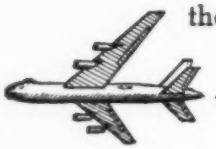


Portable Aircraft Preheat Units

These aircraft heaters are part of an order being built for Slick Airways, Inc. For preheating the engines, battery compartments and cockpits of two- and four-engine aircraft, machines are rated at 250,000 Btu./hr. and are powered by a 3.6 hp. Kohler K-90 engine. Manufacturer is Les Bowman Engineering Co., Long Beach, Calif.

Want to save weight?

FINN lightweight mounting bases could save 7¾ lbs. on the **B-52**



FINN lightweight mounting bases could save 5½ lbs. on the **F-102**

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with General Electric's turbojet development at G. E.'s Lynn plant.

Among jet engine operating problems which Texaco's laboratory technicians investigated were blow-out, combustion efficiency, deposits and correct fuel ignition.

Start In 1947

Planning for the first jet fuels laboratory started in 1947, and it was opened in 1948.

In the period 1949 to 1953, much work was done in evaluating fuels in different types of combustors. Generally, findings were that combustor problems hinged on the unit's design rather than on the type of fuel used. Technicians determined that some combustors would operate successfully on almost any kind of fuel, but others were very sensitive to the type they burned.

The old laboratory was shut down late in 1953 and through most of 1954 as the transition was made to the new facility.

Today, Texaco is putting the finishing touches on this new, full-scale jet fuel test laboratory in which the program of evaluating is under way.

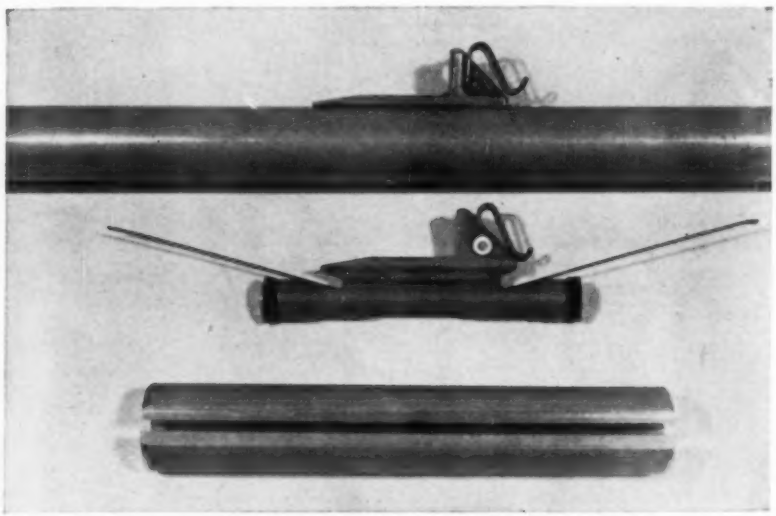
Texaco officials say that the $250,000 installation, which is part of the company's principal research center at Beacon, is the nation's largest privately owned and financed jet fuels laboratory.

Piston Actuator Launches Stores

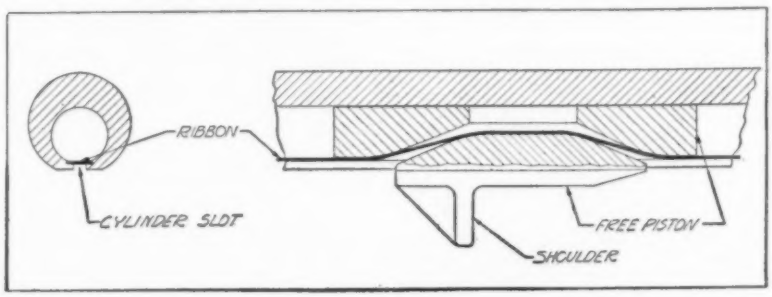
Manhattan Beach, Calif.—A free-piston pneumatic actuator which offers twice the stroke of an equivalent-length conventional cylinder-piston combination is being used for launching stores from limited space in anti-submarine warfare aircraft.

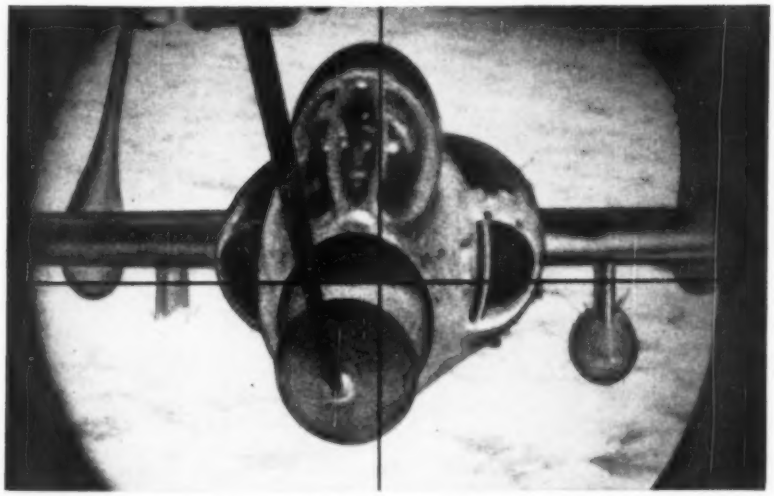
Produced by Fairchild Engine & Airplane Corp.'s Stratos Division at its western branch in Manhattan Beach, Calif., the free-piston actuator is used for launching stores such as sonobuoys, parachute flares, and sea dye markers. It also offers potential applications for such services as canopy actuation, operation of thrust reversers, tailpipe nozzle positioning, and door actuation.

The actuator consists of a slotted cylinder and a free piston with a shoulder protruding through the slot. The slot is sealed with a steel ribbon that is threaded through the piston and



ACTUATOR (top) is composed of free piston (center) and slotted cylinder (bottom). Schematic cross section (below) shows steel ribbon which seals slot in free-piston actuator





Periscope Monitors Refueling

Navy crews aboard North American AJ-2 Savage tanker planes use the Librascope MX940 bombing director periscope to observe fighter planes coming in for an air-to-air refueling. Pinpoint accuracy of the periscope helps limit the jockeying for correct position. Here a Chance Vought F8U-3 Cutlass is seen through the scope's eyepiece.

extending the length of the cylinder.

Since there is no connecting rod, a weight saving is realized, and the overall length of the actuator remains constant, only slightly exceeding the piston stroke. Thus, the free-piston configuration allows use in confined areas where space available would not permit use of a conventional actuator with piston rod extension beyond the cylinder.

In its present application for stores launching, a battery of free-piston actuators is used on the Lockheed P2V, Martin P5M, Douglas C-54 modified for air-sea rescue, and is also being incorporated in Canadair's new CL-28.

In these applications, air pressure in the area behind the free piston forces the ribbon seal against the edges of the cylinder slot, permitting only slight leakage. At the same time the piston is forced through the cylinder so that the piston's protruding shoulder engages and ejects the store. Pressure is bled past the ribbon seal to the atmosphere. System pressure is then applied to the opposite face of the piston to return it to load-position.

Air for the cycle is supplied by a 2-cfm., 3,000-psi. compressor. Pressure to the actuator is regulated to 750 psi.

New Barometric Control Measures 15-in. Changes

Los Angeles—A new barometric altitude control, accurate enough to record a change as small as 15-in. at ground level, has been developed by the Garrett Corp.'s AiResearch Mfg. Division, Los Angeles. At 60,000-ft. it reportedly can sense changes of 20-ft.

The new instrument also features a rate of descent control. When approaching a runway for landing, it will make the necessary corrections for proper descent rate quickly through the automatic pilot control.

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Delta Backing Saves Packing Gland Wear

Northrop Aircraft, Inc., has developed a promising solution to hydraulic cylinder piston packing gland wear in multicycle components such as flight control servo cylinders.

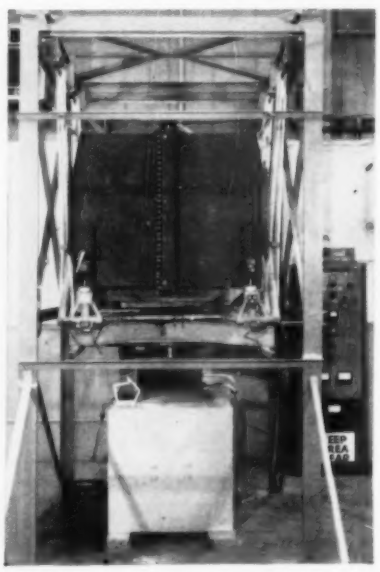
Northrop uses a modified delta backing for the O-ring instead of the conventional spiral backing, and reports that the delta type more completely supports the ring, reducing friction, minimizing distortion and wear. Operational tests, it says, in a Scorpion F-89D have exceeded 630,000 cycles without leakage or need of maintenance, and the rings are still in use.

A modification under test uses a pressure seal ahead of the external O-ring seal to absorb high pressure and friction loads, allowing a small, controlled amount of leakage which is retailed by the O-ring and returned to the system reservoir, the company says. This arrangement is seen as providing greater packing gland life, and reducing external oil leakage to a point just sufficient to maintain adequate lubrication for the hydraulic piston.

Northrop Builds New Missile Shake Tester

A midget electro-hydraulic shake tester, used to simulate vibrations encountered in launchings of the Snark SM-62 intercontinental guided missile, has been developed by Northrop Aircraft, Inc.

Measuring less than one cubic foot in volume, the shaker can apply a force of 55Gs to electronic components weigh-



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ing more than 1,000 lb. It will test the effects of frequency vibrations ranging from 5 to 600 cps.

Northrop reports that the more powerful magnetic shakers available affected sensitive instrumentation in electronic components. The new device avoids adverse effects on electronic units by substituting hydraulics for magnetic force.

The shaker operates from a horizontal or vertical position. This permits it to exert vibratory forces from more than one direction to obtain a maximum reaction from the test specimen.

Feature of the test device is a two-stage electro-hydraulic servo valve, built by Bertea Products Co., Pasadena, Calif., to afford precision control of the hydraulic power. An exciter transmits electronic impulses to the valve's pilot spool, which controls the rapid movements of the piston rod to shake the specimen.

Self-Propelled Powerplant Deliveries to Navy Start

Initial shipments of self-propelled electric powerplants for servicing Navy aircraft are being made by Consolidated Diesel Electric Corporation, Stamford, Conn. The units incorporate a heavy duty dc generator, a 30 kva., 400 cycle ac alternator, rectifier and associated controls and output cables mounted on a specially designed, all-wheel drive chassis. The same engine propels the vehicle and powers the electrical generating equipment.

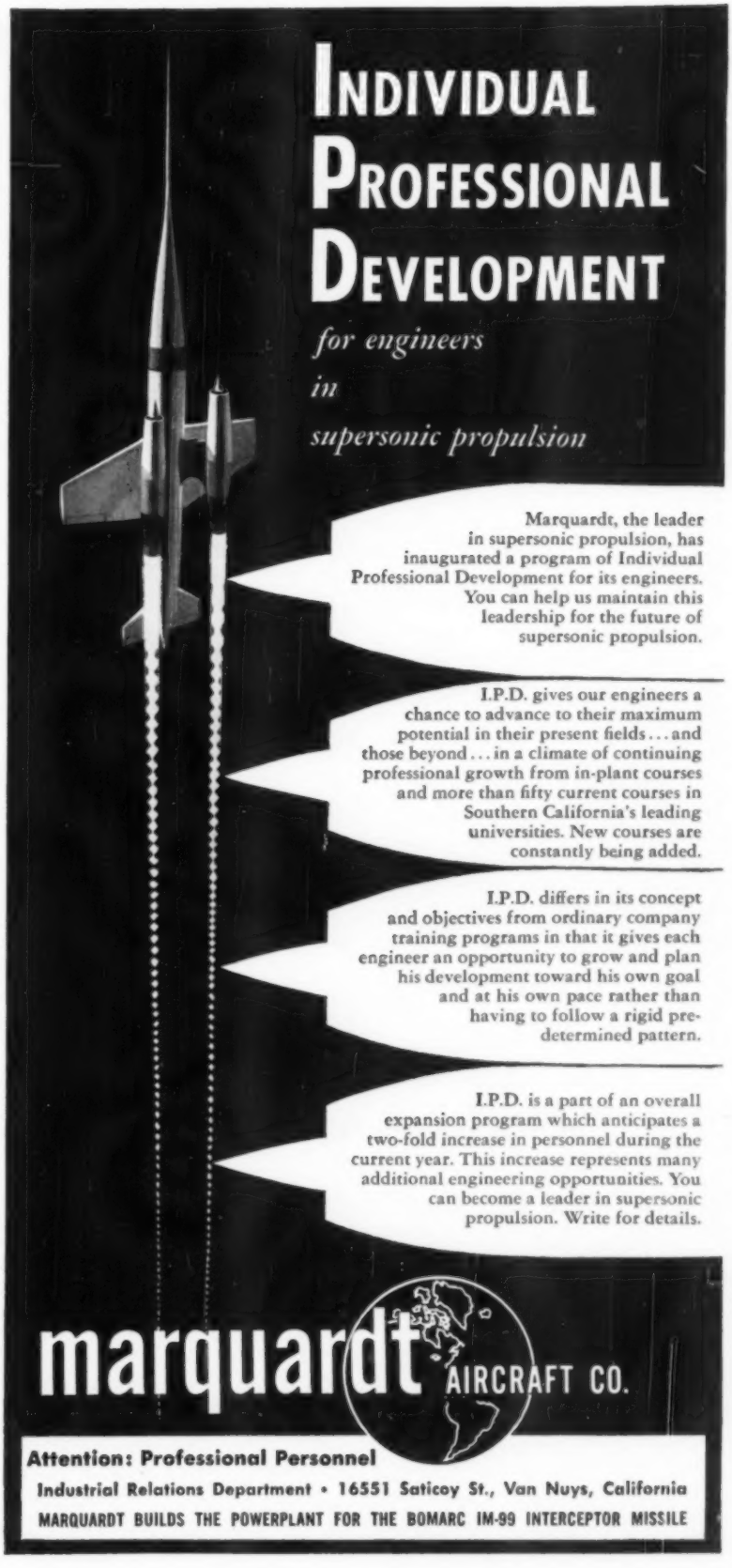
Oakland Firm to Overhaul More T-33s for Air Force

A contract to overhaul an undisclosed additional number of T-33 jet trainers has been awarded Aircraft Engineering & Maintenance Co. by the Air Materiel Command, the Oakland overhaul agency announced. The contract will require the immediate employment of 300 to 400 more employes covering most of the aviation skills.

GE Maintains 5,000 Deg., 2.7 Million psi. in Vessel

Pressures of 2.7 million psi. and temperatures of 5,000 deg. F. have been maintained for long periods in a special pressure vessel built by General Electric for use in large hydraulic presses. It is expected that use of the pressure vessel may lead to improved techniques in producing man-made diamonds and other carbides.

Dr. Percy Bridgman, Nobel Prize winning physicist, said that it might even be possible to produce a super-diamond having industrial qualities superior to those of natural diamonds.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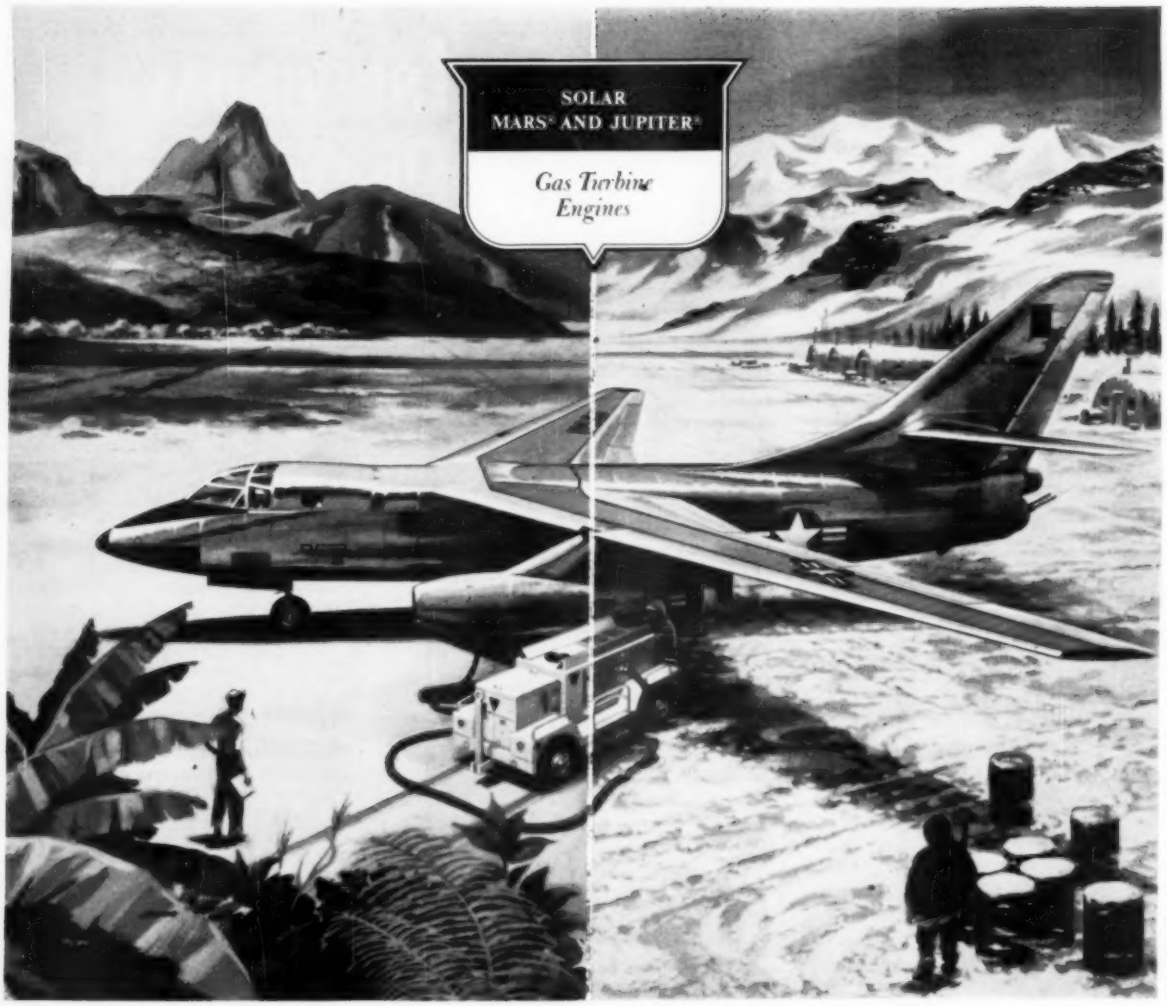

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Solar's pioneering efforts with gas turbines are a logical outgrowth of three decades of specialization. During those years, Solar has concentrated on working with tough alloys, to design and build products that will withstand difficult service conditions. Can this experience help you solve a complex engineering or fabrication problem? Dept. C-25, Solar Aircraft Company, San Diego 12, Calif.

WRITE FOR BOOKLET... new brochure describes Solar gas turbines—how they work, advantages they offer to forward-looking industries. Send for a copy today.

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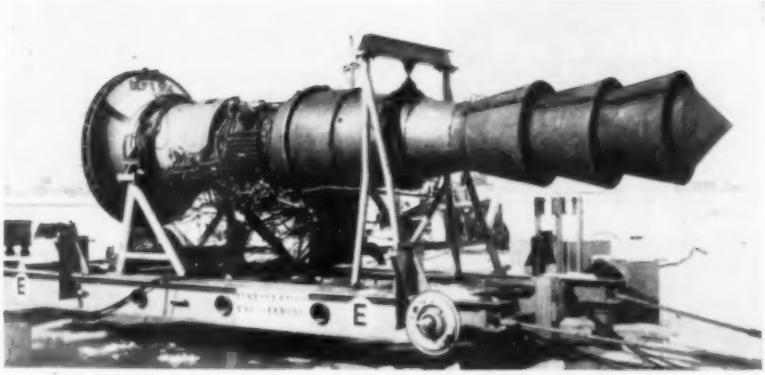


CONICAL SHROUDS are feature of P&W jet engine suppressor attached to J57.

Pratt & Whitney Offers Portable Jet Noise Suppressor Design Free

East Hartford, Conn.—An exhaust noise suppressor design for jet engine ground running, a portable device easy to install and remove, has been offered without charge to the industry and the military by Pratt & Whitney Aircraft.

An inlet noise reflector, which deals with the greatest source of noise once the exhaust has been muffled, has been built by Pratt & Whitney, though its design is not included in the offer. Further experiments are under way on inlet noise.

None of the equipment has inflight application. Wright A. Parkins, P&W general manager, said the suppressor would be helpful now at military bases and later at commercial airports when airline jets start flying. Widest use, he said, would be in maintenance and overhaul of completed jet engines. Because exhaust must be unrestricted in test cell operations in order to measure thrust output, the suppressor has no application there.

Not Whole Answer

And, Parkins made clear, the suppressor is not a complete answer to the noise problem.

"It's simply a breakthrough, a beginning," he said. "It will . . . permit mechanics to work in a more comfortable environment. It will also substantially reduce the noise in areas just behind the exhaust.

"Historically the noise problem has always been ahead of acoustical development. We have made steady advances in controlling noise, but the creation of silencing devices obviously has to trail somewhat. First, you must get the power before you silence it."

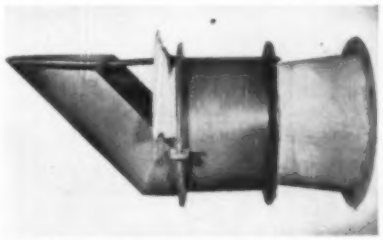
The suppressor principle was enunciated in 1954 by John M. Tyler, chairman of the P&W Noise Control Committee, and Edward C. Perry, Jr., of United Aircraft Research department.

"The suppressor has allowed us to make heartening advances in this particular field of sound control," Tyler said. "We conducted a test recently before a non-technical group at the Boeing Airplane Co. plant in Seattle, the suppressor attached to a J57 engine on a B-52. The engine was started and after idling a few minutes we increased the power to where it normally would be developing more than 10,000 lb. thrust.

"The spectators were standing about 100 ft. away talking in conversational tones. It was only after one of them inquired as to when we were going to run up the engine that they learned the test had been completed."

Won Awards

The Tyler-Perry paper, which discussed the overall jet noise problem, won the Manly Memorial Medal and the Wright Brothers Memorial from the Society of Automotive Engineers. Tyler described an early model of the suppressor, a perforated sheet metal cylinder, in an SAE paper last year. This year an SAE paper by Tyler and Robert Krieghoff described refinements of the suppressor, notably three conical shrouds wrapped around the cylinder, and the inlet reflector.



HALF-SCALE model of inlet reflector has bellmouth reflector to modify airflow.

The conical shrouds were added, the SAE paper said, to give the exhaust gas an appreciable rearward velocity after it has escaped through the perforated sheet metal. This feature is necessary to prevent recirculation or overheating the wing on an airplane with the engine pods below and ahead of the wing.

After the exhaust noise is suppressed, the inlet noise becomes the most objectionable, the paper said. To a mechanic working near the inlet, the piercing note produced by the impingement of the compressor blades on the inflowing streams of air, can be even harder to hear than the unsuppressed exhaust.

Rather than absorb this noise, Tyler and Krieghoff decided to reflect it upward. They found the reflector reduced the overall noise ahead of the engine 7 to 13 decibels, at a cost of disturbing the airflow to the engine inlet.

Since these sound tests were made, a bellmouth section has been added at the entrance of half-scale models of the reflector and a configuration has been found in which average pressure losses are approximately equal to the pressure losses without the reflector. Further sound tests are planned to determine whether the noise reduction characteristics have been affected.

Afterburning Engines

For afterburning engines, Pratt & Whitney plans to use an all-steel silencer for engines being run in the open. Such a silencer installed last year has been satisfactory, the paper said.

From their work on ground noise equipment, the authors concluded:

(1) Primary advantage of suppressor and reflector is that they can be carried to the ramp and snapped in place, and the airplane is ready for ground running. They can be removed just as quickly and the airplane is ready to taxi out and take off. It has been found on the J57 that the exhaust suppressor has no significant effect on operation either above or below critical pressure ratio. Tests have been run in the 6,000 to 10,000-lb. thrust range.

(2) Easy installation and removal has enhanced the value of the equipment, saving a great deal of running at high power without benefit of noise control.

(3) Noise of the J57 with the exhaust suppressor attached drops into the industrial background level in a relatively short distance, and further reductions in exhaust noise would not be very helpful. Discrete frequencies from the inlet are greatly reduced by the reflector.

Assuming mechanics wear ear protection and are exposed for short-time periods to noise, the authors sum up:

". . . With suppressor and reflector installed it is obvious that the risk of

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damage to the hearing of mechanics who may need to work on the engine operating at high thrust has been practically eliminated."

The suppressor is 6 ft. long, 2 ft. in diameter and weighs 150 lb. It has a single Marmon clamp which permits easy attachment to the tailpipe. Development work was done on the J57, but the principles are applicable to any jet engine, P&W says.

It is not strictly a silencer, but a noise control device. Turbulent flow is controlled so that the noise produced is of such high frequency it is not audible to the human ear.

Republic Aviation Corp. tested a ground noise suppressor last January. This muffler has a 20-ft. pipe leading into a tank 10-ft. in diameter and 20 ft. long. The airplane must be backed up to the muffler. The muffler is portable in that it can be moved to various places on an airfield.

North American to Build Mach 2 Wind Tunnel

Another major step toward self-sufficiency has been taken by the Columbus division of North American Aviation by contracting for a new two-story engineering building addition and a wind tunnel with Mach 2 capacity.

Primary function of the division is development and production of Navy aircraft.

It is currently turning out the FJ-4 Fury, an extensive redesign of the original sweptwing Fury. In addition, a new Navy attack airplane, the A3J, is under development.

A jet trainer design, the T2J, has been entered in the current Navy competition.

The wind tunnel is planned to cover both subsonic (up to about 300 mph.) and supersonic (up to Mach 2) speeds.

Parachute Flares Used In Copter Night Landings

Helicopter night landing technique using parachute flares has been tested by Westland Aircraft, Ltd., Yeovil, England using a Whirlwind (S-55) before officials of British Air Registration Board. At 1,000 ft. the pilot released a 75-sec. flare, simultaneously cut the engine and began autorotation; at 500 ft. a 45-sec. flare was released.

Large Contract Awarded For Portable Starters

USAF production contract of $5,121,974 covering MA-1A portable starters for large jet planes has been awarded Continental Aviation & Engineering Corp., Detroit, Mich.

NEW AVIATION PRODUCTS

Small Fan For Missiles

Animax II cooling fan for missiles weighs four ounces and measures 2 in. in diameter by 1.5 in long. It moves 58 cu. ft./min. at free delivery and 35 cu. ft./min. at two inches static pressure.

Unit runs at 20,000 rpm. and is

wound for 400 cps. only, either 200 v., three-phase or 115 volt one-phase. Both have an input of 35 watts. Solder-type hermetic terminals allow the fan to be enclosed in an airtight closed piping system.

Rotron Manufacturing Co., Schoonmaker Lane, Woodstock, N. Y.

Vacuum Pump Reduces Pressure

Electric-motor driven oil-wetted vacuum pump Model RG-10970 is designed to reduce air pressure as required for satisfactory operation of electronic pressure transducer tester. This unit can be oriented in any position and the oiler can be pressurized to 15 psi.

Range of operation covers sea level to

10,000 ft.; using silicon oil, temperature range is −31F to +150F. Capacity is 1,200 cu in./min. minimum free air flow.

A radio noise filter is included.

Lear-Romec Division, Lear, Inc., Elyria, Ohio.

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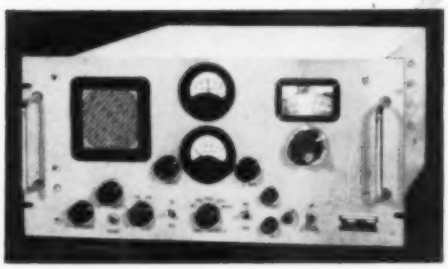

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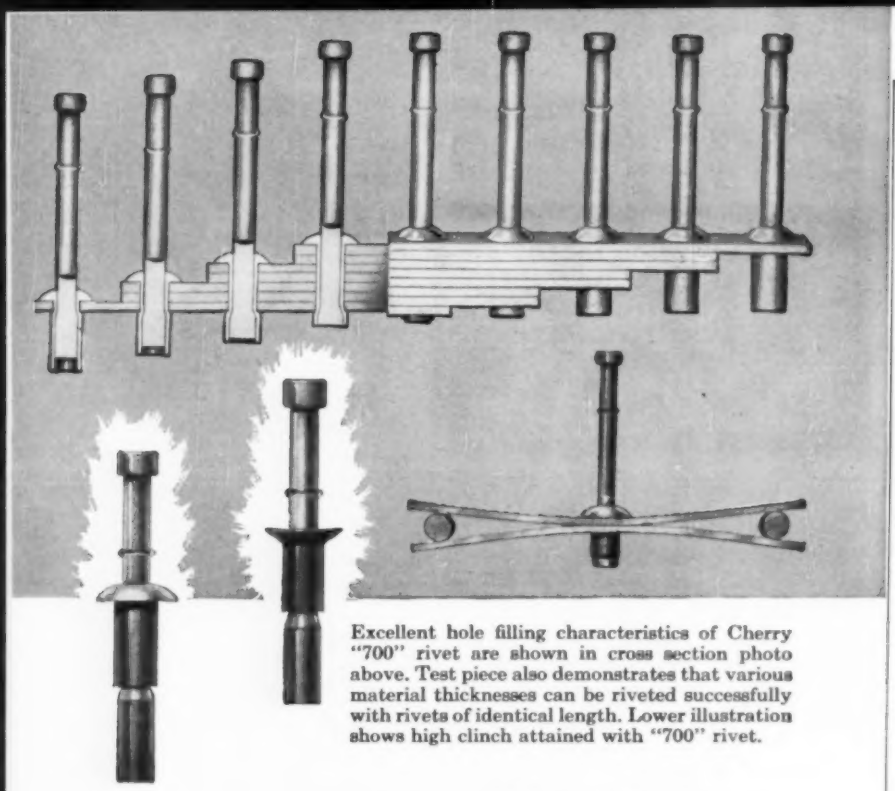

Excellent hole filling characteristics of Cherry "700" rivet are shown in cross section photo above. Test piece also demonstrates that various material thicknesses can be riveted successfully with rivets of identical length. Lower illustration shows high clinch attained with "700" rivet.

Versatile Cherry "700" Rivet Provides New Uniform Fastening Method

The hole filling qualities, wide grip range, high clinch, and positive stem retention now possible with the new Cherry "700" rivet give the aircraft industry a uniformity of fastening never before available.

In the past, variations in hole diameter made it virtually impossible to completely fill the hole in every instance. This difficulty is eliminated with the "700" rivet which always adjusts to fill the hole and provides high stem retention.

The method of setting the "700" rivet also provides high clinch and makes it possible to use one length to fasten a wider range of material thicknesses. Positive inspection is easy since a properly set rivet is indicated by the amount of stem shoulder protruding above the rivet head.

The "700" rivet is available in countersunk and universal head styles in a wide range of diameters and lengths. It is installed with standard Cherry rivet guns with controlled-stroke pulling heads and accessories.

A product of the Cherry Research and Development Department, the "700" rivet has back of it years of fastening experience in the aircraft industry. This organization has developed the widest range of types and sizes available in the industry. Cherry engineers have designed and built special purpose machines and developed techniques that make possible such innovations as the "700" rivet.

For technical data on how the Cherry "700" rivet will give you a more uniform method of fastening, write to Townsend Company, Cherry Rivet Division, P. O. Box 2157-N, Santa Ana, California.

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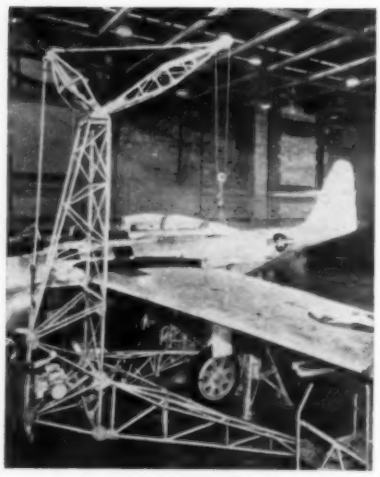


craft engines or other heavy components has been developed for the Air Force. It can be towed at 20 mph. Crane weighs 2,000 lb. and has a rated capacity of 5,000 lb. Hook clearance is 22 ft.

Safway Steel Products, Inc., 6234 W State St., Milwaukee 13, Wis.

ALSO ON THE MARKET

Engine and flight hour meters, designed for direct reading, are true timing instruments, not a revolutionary counter. Engine-hour meter records actual operating time of aircraft engine. Flight-hour meter indicates number of hours aircraft is actually airborne. Items available in a range of voltages.—Air Associates, Inc., Teterboro, N. J.

Electomatic universal testing machines now available equipped with an XY electronic recorder which can be used in place of, or in conjunction with, standard dial indicator. Unit not only plots load applied, but also load vs. extension (stress-strain) or load vs. time.—Tinius Olsen Testing Machine Co., 5257 Easton Rd., Willow Grove, Pa.

Precisionaire gage has been developed for measuring how much a bolt stretches when tightened in an assembly. Item will accommodate variations in bolt length. Lever-operated cam mechanism retracts locating pin and gaging pin so that part can be revolved to next bolt without being raised.—Standard Production Instruments Division, Sheffield Corp., Dayton 1, Ohio.

Force gage for 50,000-lb. tests is available for either compressive or tensile tests and has a warranted accuracy of within one percent of indicated reading. Dimensions of compression model: 5¼-in. high, 3½-in. thick (including dial

indicator), 8-in. wide, 30-lb. net weight. Dimensions of tensile model: 10-in. high, 3½-in. thick (including dial indicator), 8-in wide, 37-lb. net weight.—W. C. Dillon & Co., Van Nuys, Calif.

Molded rubber blankets or bags of virtually any contour have been developed for use in vacuum molding of any reinforced plastic laminates. Bags will withstand temperatures up to 240-250-F, and a tear can be repaired for as little as cost of a cold patch.—Quaker Rubber Division, H. K. Porter Company, Inc., Tacony & Comly St., Philadelphia 24, Pa.

Aircraft tiedown kit contains three stakes, two 10-ft. and one 6-ft. lines, a 2-ft. bar to turn the stakes.—Rupert Parachute Co., Wheeling, Ill.

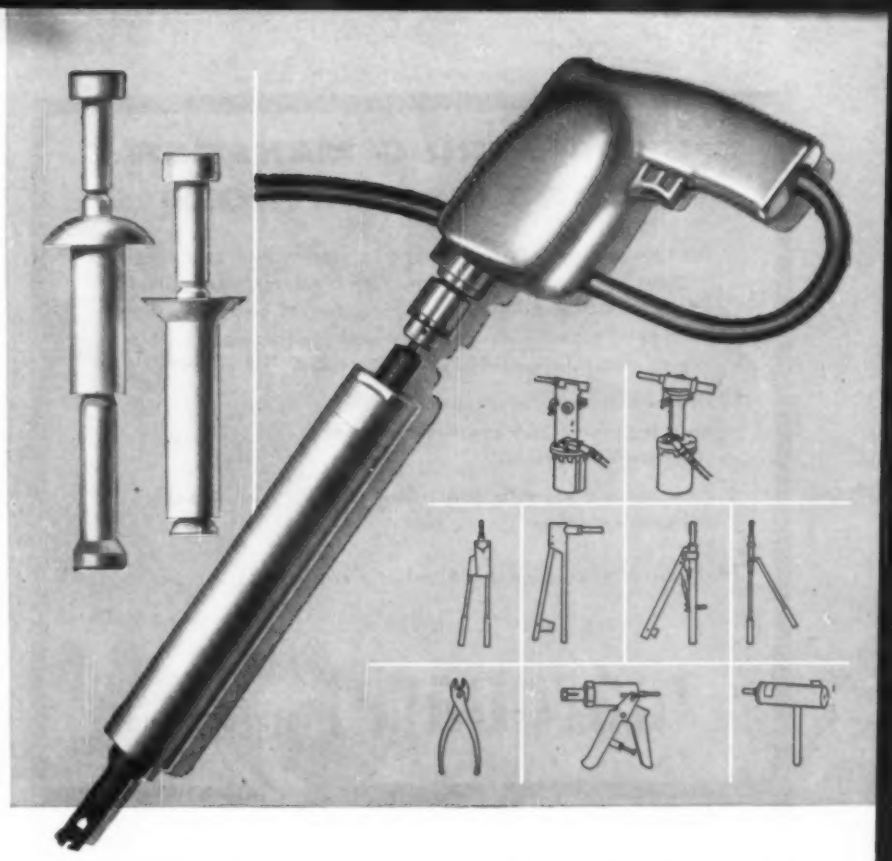
Blind rivet setting gun is designed for operation with standard ¼-in. electric pneumatic drill. It will set all lengths and diameters of aluminum, steel and monel Cherry rivets and Townsend commercial rivets. Weight (without drill motor): 3¼-lb.; length (including pulling head but without drill motor): 14½-in.—Cherry Rivet Division, Townsend Co., Santa Ana, Calif.

Ultrasonic degreaser for cleaning parts for finishing or assembly. Unit is 24x10x18-in. deep and can accommodate work pieces 8x8x10-in. Two cleaning stages are featured: vapor degreasing and ultrasonic solvent cleaning, in order desired. Ultrasonic power up to 500 w. at 40 kc. frequency is available over an area of 7x9-in.—Industrial and Scientific Products Division, Curtiss-Wright Corp., Caldwell, N. J.

Lefkoweld adhesives, based on new epoxy resins, are designed for general and special purpose bonding of rigid materials such as metals, glass and plastics. They meet the tensile requirements of MIL-A-5090B for aircraft structural assemblies. — Leffingwell Chemical Co., Perry Annex, Whittier, Calif.

Degreasing basket holds heavy extra-long parts such as aircraft frames, shafts, and other long sections for cleaning. Unit combines two sections, a basket and frame (with basket nested in frame). It holds a maximum number of pieces in a minimum of space, with largest possible surface area of each part exposed. Frame is 11-ft. x 29-in. x 33-in.; basket is 10-ft. 6-in. x 26-in. x 20-in.—Wiretex Manufacturing Co., 40 Mason St., Bridgeport, Conn.

Servoboard electro-mechanical precision assembly kit now five times as many



Another Development of Cherry Research Gives You Greater Fastening Efficiency

Newest in a long line of Cherry developments is the rivet gun shown above which will set any type or size Cherry rivet. The G-80 gun is powered by either a standard electric or air driven drill.

The versatility, positive action, ease of handling and maintenance-free service you get with this new G-80 gun will bring increased efficiency to your production lines—reduce equipment inventory—help cut unit costs.

This Cherry gun was designed and developed by the research department of the Cherry Rivet Division at Santa Ana, California, where it is also manufactured. In fact, all the tools for installing Cherry rivets are developed and produced in this plant. They are used to install a major portion of the blind rivets in use today by all industry.

In addition to developing installation tools, the Cherry research department is experimenting constantly with new designs and materials for aircraft fasteners in order to meet the greater stresses and higher temperatures imposed by ever-increasing aircraft speeds and loads.

This research recently resulted in the introduction to the aircraft industry of the new Cherry "700" rivet which has characteristics far superior to any blind rivet made previously. It provides a wide grip range, positive hole fill, high clinch, uniform stem retention and permits 100% positive inspection.

For information on Cherry rivets and the tools for installing them, write Townsend Company, Cherry Rivet Division, P.O. Box 2157-N, Santa Ana, California.

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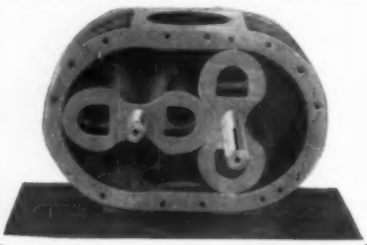

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parts. Gears, previously "solid-hub" components, are now available as split-hub gears as well. Adapter gears, mitre gears, bevel-gears and anti-backlash gears have been added. Micro-switch assembly and associated cams and pulse disk are included. – Servo Corporation of America, 20-20 Jericho Turnpike, New Hyde Park, L. I., N. Y.

Drawing instrument features ⅛-in. and ¼-in. scale, and 12-in. ruler. Item contains a double calibrated 180-deg. adjustable protractor, ¼-in. pointers, templates for making circles, french curves and common symbols, and square and straight edges. Tool measures 8½ x 12-in.—Handee-Dandee Products, Inc., 3019 Pico Blvd., Santa Monica 8, Calif.

Guardair air gun provides a protective umbrella of high-pressure air to prevent chip flyback. Air release is trigger actuated. Adjustable knurled stop nut controls output of air and allows repetitive use at controlled pressures. Item fits standard air lines.—Union Engineering Corp., South Hadley Falls, Mass.

Cherry "700" rivet provides a wide-grip range, positive hole fill, high clinch, uniform stem retention and permits 100% positive inspection. Item is made in countersunk and universal head styles in a variety of diameters and lengths.—Cherry Rivet Division, Townsend Co., Santa Ana, Calif.

K15300 series stop clocks, with electrical reset which permits local or remote control or automatic operation for measuring successive time intervals, facilitate accurate measurement of time intervals in military and industrial applications. Units are accurate to ±0.2% of reading; ±20-ms from −55-C to 85-C over wide voltage variations.—A. W. Haydon Co., Waterbury, Conn.

Plastic box keeps portions of flight meals chilled up to 12 hours without mechanical refrigeration. It has molded-in racks for 14 serving trays, and a built-in tray for 3-lb. of dry ice (which will keep food at 45-F for hours). Approximate size: 30-in. wide and high x 36-in. deep.—Pynn-Hawley Co., Rutherford, N. J.

Confidential paper destroyer reduces confidential papers or similar material to white ash with noiseless, smokeless and odorless firing. Item operates on Hydroxolation principle of low temperature burning; no supplementary fuel is needed. It can be located indoors or out.—Outdoor Oven Fireplace Co., 850 Windsor St., Hartford 5, Conn.

This is John V. Sigford, manager of our Los Angeles missile control activities. His profession is engineering. His company is Honeywell—has been for 19 of his 20 professional years. For the past 10 years his specialty has been flight control of aircraft and missiles. John and hundreds of Honeywell engineers like him have made Honeywell Aero a leader in missile guidance and control.

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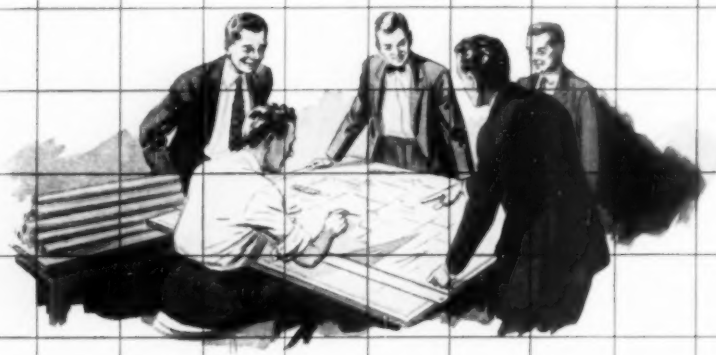

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Here systems engineering assumes paramount importance. Component and assembly design are examined critically, always in relationship to the over-all system. And unique RREP building block design permits individual components and assemblies to be package engineered into form factors to fulfill a wide variety of applications.

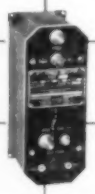
It is no accident that the famous names in missile design specify RREP transmitting systems for reliable data transmission under unbelievably rugged conditions. *Creative engineering is the difference!* And with the stepped up importance of remote airborne instrumentation, RREP is in continually close cooperation with aircraft and airframe manufacturers developing the systems of tomorrow . . . systems capable of operating at fantastic extremes of acceleration, pressure and heat.

If you're looking for the answer to a particularly challenging telemetering problem . . . look to RREP!

- TELEMETERING
- MISSILE GUIDANCE
- GROUND ELECTRONICS SYSTEMS
- AIRBORNE ELECTRONICS SYSTEMS

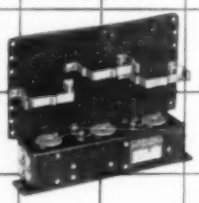
Whatever your remote instrumentation requirements, let RREP creative systems engineers take over . . . from design to installation, service and testing follow-through. Technical bulletins sent on request.

RREP Type 1001A Crystal Controlled Transmitter. RF power output: 3.5 to 4.5 watts into 52-ohm load. Frequency range: 215 to 235 megacycles as required. Frequency stability: ±0.005%.



RREP Type 1101A RF Power Amplifier. RF power output: 25 to 35 watts. Frequency range: 215 to 235 megacycles.

RREP Type 1401A UNERAC (Universal Electronic Regulator, Amplifier and Calibrator). Building block design—when tier mounted with one or several universal oscillator mounts, forms the central control and distribution center for a transmitting system.



RREP Type 1402A Universal Oscillator Mount. Designed to provide mounting facilities for three subcarrier oscillators . . . incorporates building block features that permit tier mounting to produce transmitting system containing up to 18 subcarrier oscillators. Provides interchangeable mount for wide variety of RREP type oscillators.

RAYMOND ROSEN ENGINEERING PRODUCTS, INC.

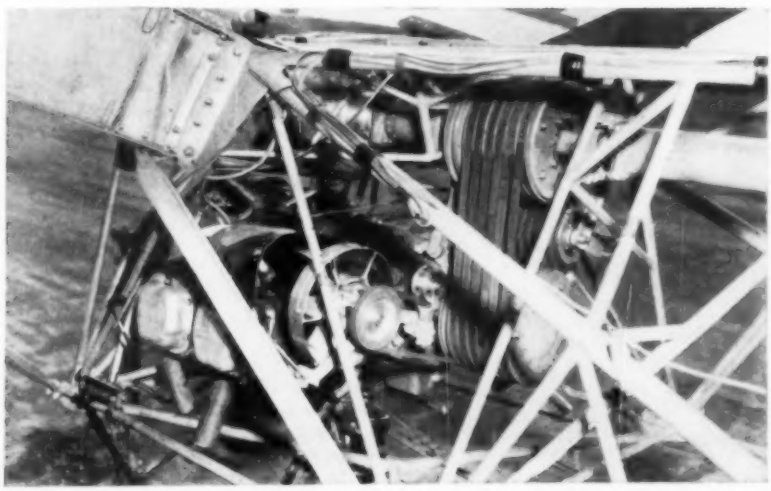
32nd and Walnut Streets, Philadelphia 4, Pa.

Western Regional Sales Office: 15106 Ventura Blvd., Sherman Oaks, Los Angeles, California

HOVERING OUT OF GROUND EFFECT, 360-deg. turns, forward and rearward flights have been made by Convertawings' Model A.

Convertawings Start Helicopter Tests

A direct mechanical control system for a future multi-engine large transport helicopter is being developed by Convertawings, Inc., Amityville, N. Y. The firm is flying the system on its Model A testbed powered by two 90-hp. Continental engines. Convertawings president Dave Kaplan (photo, right) reaches for his safety belt prior to a flight test. V-belt connection from forward engine to transmission shaft (below, left) is duplicated at rear of the craft. At each end are gear clusters providing 3:2 reduction to the shafts connected to the four rotors. Either engine can drive all rotors. Rotor outrigger and 19.4-ft.-diameter blades are detailed at bottom right.



Cessna's New Dealer Promotion a Success

By Erwin J. Bulban

Cessna Aircraft Co., totting up the results of a new sales promotion technique in the aircraft industry, finds the results gratifying.

Previously Cessna, like most of the rest of the industry, had introduced its business and pleasure airplanes to dealers and salesmen in a showing over several days at its Wichita, Kan., plant. There were several drawbacks to this system, among them the travel and expense involved for the dealers themselves and the loss of man-hours to factory personnel in setting up and programming the exhibit. Most important of all, the general public was excluded.

So this year Cessna decided to take a leaf out of the promotion book of the automobile industry. The company exhibited its wares much the same as automobile companies announce new models through their dealers at local shows. Beginning in mid-March and lasting through mid-April, sales teams from the factory took fleets of 1956 demonstrators, comprising a complete line of business aircraft, around to distributors throughout the U. S. and Canada.

The results:

- **Over $1,435,000** worth of airplane orders signed.
- **A total of 71** business aircraft sold: 34 Model 182s, 5 Model 180s, 19 Model 172s, 2 Model 170s and 11 twin-engine Model 310s.
- **Between 35,000 and 40,000** persons, estimated, exposed to the company's "Fabulous Fleet for '56."
- **Orders directly traceable** to the shows still coming in.

International Aviation Industries, Inc., a Cessna distributor at Westchester County Airport, told AVIATION WEEK it has potential sales estimates on over $2.5 million worth of airplanes, with some orders already signed and planes delivered. Five planes were sold during the show.

International was hit by bad weather during its public presentation. Nevertheless over 500 people showed up. The distributor received an exceptional publicity break, their exhibit gaining a featured spot on the television news program of NBC's John Cameron Swayze.

Fast Sales

A spot check around the country provided these accounts of customer reaction:

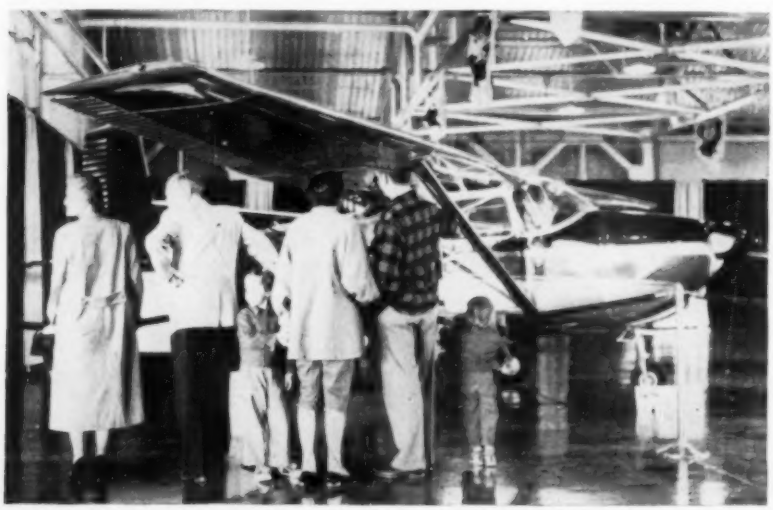
- **At Ft. Worth, Tex.,** a dealer sold five airplanes during his show, one to a man who had walked in out of curiosity, watched the Cessna movies, and had a demonstration ride in a 182. He bought an airplane on the spot, trading in his older ship.
- **In Portland, Ore.,** a businessman who had not flown for five years took demonstration flights in the 182 and 310. He discussed the possibility of buying a 182, but when he returned the next day he picked the 310 and wrote a check for $67,000. He took immediate delivery on an airplane in the display area and flew home with the dealer's check pilot.
- **In San Angelo, Tex.,** the day before the local showing of the Model 182, the owner of a new 172 washed out his airplane while practicing crosswind landings without an instructor. The Cessna dealer called the man that evening. The man decided he needed an airplane in his business, adding that he had wrecked his car the previous year and had replaced it—so why not purchase a new airplane? He bought a 182.
- **In Wichita, Kan.,** four airplanes were sold. Three free courses in instruction on the 172 were included in the door prizes, which included color photos, tie clips, cuff links and sets of highball glasses.

Some dealers really put their imaginations to work in their presentations.

At Lubbock, Tex., a black-and-gold theme set off the show. All planes were painted black and gold or gold with white trim, black-and-gold streamers hung over the display area, and the dealer wore a black suit with gold accessories.

In Seattle, Wash., and Little Rock, Ark., dealers developed a carnival theme, using circus tents for their displays. The Seattle man brought in three carloads of wood shavings to give the tent a sportsman's atmosphere.

Many prospective buyers brought their wives to the shows. Special 12-minute 16-mm. color and sound movies, introducing the 182 and showing a 310 demonstration, helped sell the wives on the airplane as a means of

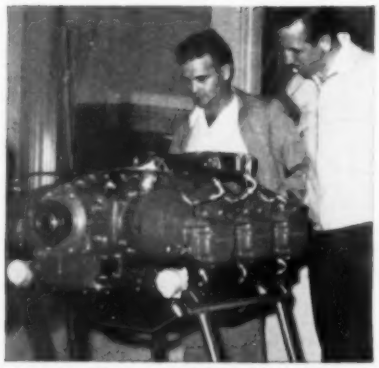


KANSAS FAMILY meets the Cessna 182 at public display in Wichita; box (right) shows how the rest of the country took to shows.

How Public Attended Cessna 182 Showings*

San Antonio, Tex.	1,000
Wichita, Kan.	3,500
Austin, Tex.	3,500
Lubbock, Tex.	1,500
Idaho Falls, Idaho	1,500
Edmonton, Canada	4,000
Boise, Idaho	1,000
Fort Lauderdale, Fla.	1,500
Northbrook, Ill.	2,000
Denver, Colo.	6,000
Seattle, Wash.	3,000
East Alton, Ill.	1,000
Westchester, N. Y.	500

*This is a sampling of the 40 showings at Cessna distributors and dealers; total attendance is estimated at between 35,000 and 40,000.



CONTINENTAL ENGINE for 182 in Wichita display.

business travel, some dealers reported.

Long before the show went on the road, the Cessna dealers had four detailed folders from the factory, packaging the entire presentation. There were 65 pages of double-space text covering: How to Plan It, How to Execute It, How to Publicize It and How to Advertise It. Check lists were provided so that the dealer could keep a visual record of how the plan was being followed and whether the schedule was being maintained. There was even a two-view scale layout for a 28-seat theatre to house the movie displays.

Factory officials told AVIATION WEEK they had a good source for laying out the master plan: They obtained the sales show book and promotion package used by a large U. S. automobile manufacturer and modified it to fit their purpose.

Three-Day Schedule

The three-day schedule was broken down this way:

• **Dealers, operators** and salesmen of the distributor were invited the first day. The distributor was encouraged to bring in the press for a luncheon and demonstrations.

• **Customers retail** prospects and the public were invited for the second and third days. Bringing the show to the public was part of the Cessna concept of display merchandising its new line on a nationwide basis. The company feels that though many of these people will never buy an airplane, publicizing the job business flying is doing is vitally necessary to the development of the industry. Dealers provided free coffee and doughnuts to show visitors and gave free rides. A Cessna dealer in Northbrook, Ill., made more than 200 demonstration flights in the Chicago area, taking up more than 600 people.

Hundreds of people seriously inquired about buying a new or used airplane and what was involved in learning how to fly, and many dealers reported a quick upswing in flight instruction business after their shows.

U. S. BUSINESS & UTILITY AIRCRAFT SHIPMENTS

(January—April 1956)

	Aircraft		Builder's Net Billing Price	
	April	Jan.-Mar. Total	April	Jan.-Mar. Total
Aero Design 560-A	7	20	$890,000	$1,739,700
680	5	4		
Beech Bonanza	46	130		
Super 18	11	21		
D18S	1	2	3,043,115	6,788,908
Twin-Bonanza	12	33		
Model 45 trainer	5	0		
Callair A-4	1	5	5,116	18,008
Camair 480 Twin-Navion	2	7	66,450	269,000
Cessna 170	11	32		
172	103	530		
180	39	243		
182	127	78	3,713,519	9,713,931.69
195[1]	5	0		
310	20	64		
325[2]	1	1		
Champion 7EC	17	38	58,037.21	168,500
Helio 391-B Courier	2	7	46,000	162,000
Lear Learstar Mk. 1	1	2	400,000	800,000
Mooney Model 18C	3	3		
Model 20	2	13	30,253.80	140,990.85
Piper Super Cub PA-18	18	57		
Super Cub PA-18A	54	135		
Tri-Pacer PA-22	130	303	2,196,229.39	5,681,338.65
Apache PA-23	36	105		
Royal Gull P-136L	1	6	74,500	447,000
Taylorcraft Model 20	3	8	27,000	73,153.80
Totals	663	1,847	$10,550,220.40	$26,002,530.99

[1] Factory-owned airplanes disposed of to private buyers. One 195 retained for use by Cessna president Dwane L. Wallace.
[2] Agricultural version of L-19.

Source: Compiled by AVIATION WEEK from manufacturer's reports. Previous tabutions for 1956: AW May 7, p. 103; April 2, p. 67; Mar. 19, p. 63.

Peak Plane Deliveries In April

Record-breaking shipments of 663 business and utility aircraft having a total net billing value of $10,550,220 were made by U.S. manufacturers in April. It was the highest month in number of aircraft and dollar volume this year and exceeded all months last year by wide margins. The industry's January-April total was 2,510 planes valued at $36,552,751 (box above).

Cessna Aircraft Co., Wichita, Kan., maintained its lead in units and dollar volume. Its 306 airplanes shipped with billing value of $3,713,519 brought its four-month total to 1,254 planes valued at $13,427,450. In numbers of airplanes this four-months total exceeded that of Aero Design & Engineering, Beech and Piper combined; however their total dollar volume was $20,339,290.

Of the 663 airplanes delivered by the industry in April, the Big Three shipped 619 valued at $8,925,263, bringing their totals for the first four months to 2,353 planes valued at $31,137,042. They delivered 1,483 airplanes worth $20,626,000 in the same period last year. Cessna deliveries and dollar volume in the four months were double the same period in 1955.

Manufacturers delivered 351 multi-engine business aircraft in the first four months compared with slightly over 200 for January-April 1955.

Exports Up 62%

Export shipments of business and utility planes climbed 62% in April over the average monthly rate last year, with five manufacturers delivering 86

PUBLISHING DATE

August 6, 1956

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TIMED TO FEATURE

- **AIR RESEARCH AND DEVELOPMENT PROGRAM** as determined by the 1957 fiscal Airpower budget now in debate and to become effective **July 1, 1956.**
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- **UP-TO-THE-MINUTE RESEARCH DEVELOPMENTS** in avionics, aeronautical engineering and missile engineering.
- **ON-THE-SPOT REPORTING** at all the 12 research and development testing centers of AIR RESEARCH AND DEVELOPMENT COMMAND of the United States Air Force by AVIATION WEEK's technical editors — the largest technical staff in Aviation publishing.

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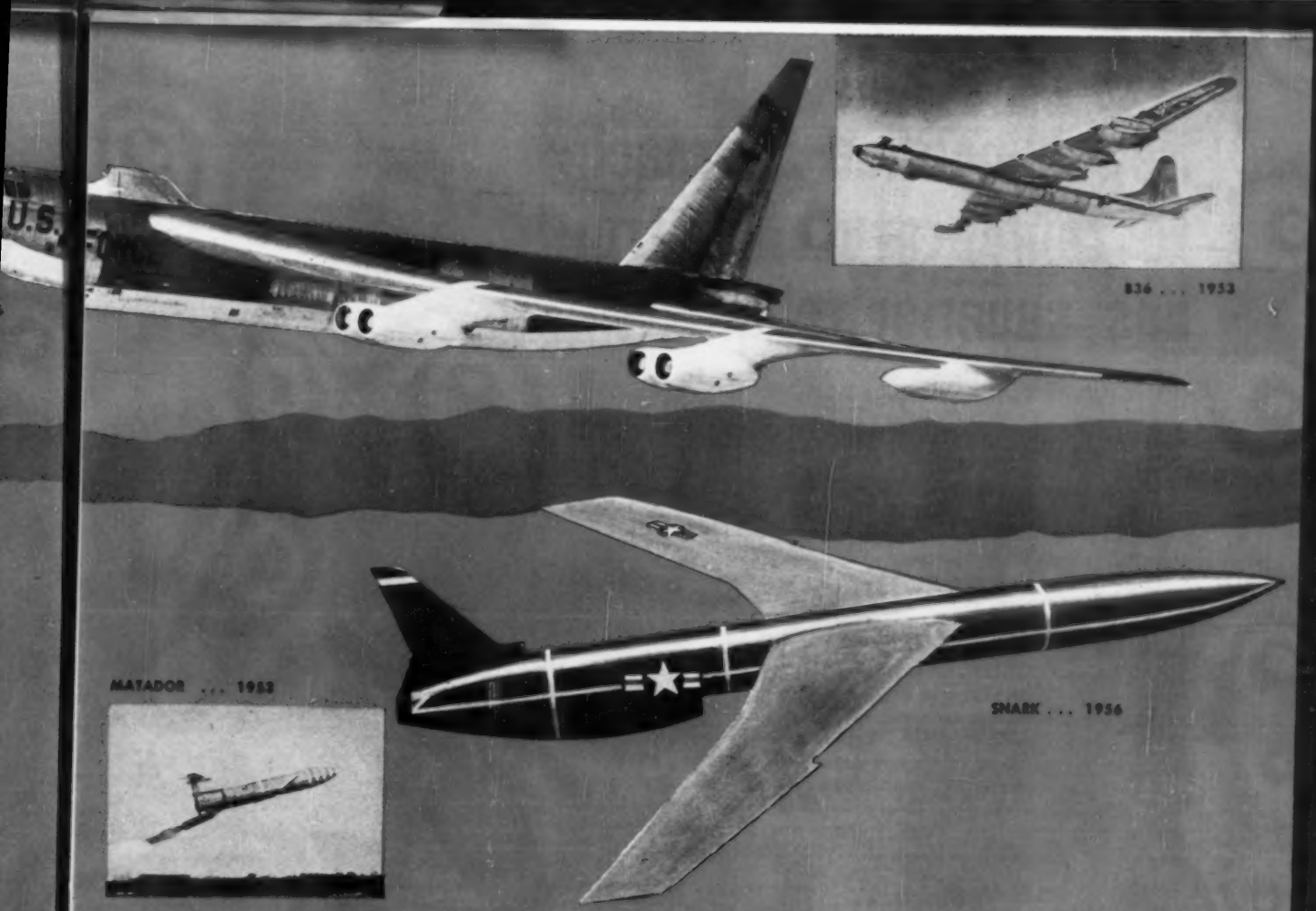

EXCERPT FROM HEADQUARTERS ARDC LETTER TO AVIATION WEEK

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Proved in service on the Douglas C-124 Globemaster, the Convair delta wing F-102, the Boeing B-50 and many other operational aircraft, the Edison simplified temperature control now reverses the trend toward complexity in aircraft accessory systems.

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aircraft valued at $969,996 to 22 foreign countries. Average aircraft exports last year were 53 airplanes that were worth $624,460.

The April deliveries abroad brought the total through April to 301 valued at $3,253,207.

Reporting exports in April were Aero Design & Engineering, Beech, Cessna, Piper and Taylorcraft. Shipments by country, number of aircraft in parentheses: Algeria (1), Argentina (5), Australia (1), Brazil (2), Cambodia (2), Canada (21), Chile (3), Colombia (10), El Salvador (2), French Equatorial Africa (1), Guatemala (1), Indonesia (1), Iran (8), Mexico (7), New Zealand (3), Nicaragua (1), Norway (3), Sweden (1), Switzerland (1), Union of South Africa (7), Venezuela (4) and Yemen (1). In addition there were four airplanes delivered to Alaskan purchasers.

Lodestar Cruises at 260 Mph.

An extensive modification of the Lockheed Lodestar as a business transport, being flight tested by Minnesota Airmotive, Inc., is designed to cruise at 260 mph. on 55% power at 7,000 ft. and over.

The modification has a fuel tank arrangement providing 854 gal., enough for 1,700 mi. The Steward-Davis conversions of the Wright 1,300-hp. R-1820-56As burn approximately 105 gal./hr. at 60% power, the modification firm reports.

As soon as flight tests are completed, Minnesota Airmotive will send the fully equipped prototype with finished interior around the country on a demonstration tour. Marketing plans include:

• **Price of $275,000** complete with interior to the customer's specifications and including radio and navigation gear. The customer is offered as standard equipment his choice of Sperry, Collins or Bendix autopilots. Radar will cost about $20,000 extra, including installation. The second Super Lodestar probably will be fitted with Collins radar.

• **One-year unconditional guarantee** to include airframe, powerplants, wiring and engineering.

Fuselage Modifications

Following a complete teardown of the basic Lodestar and and an overhaul to Civil Aeronautics Administration specifications for an 8,000 hr. check, Minnesota laps all fuselage skin not parallel to the line of flight with Minnesota Mining & Manufacturing Co. aerodynamic seal to minimize skin turbulence and drag. This procedure also is followed on the wings and tail. The former fuselage-to-stabilizer fairing saddle is removed and a new one of aluminum extends farther forward, cutting drag and providing an area for a flush antenna. A new front spar beam is installed, 9 in. lower and flush with the cockpit floor. The covered box previously located ahead of the spar is deleted, providing easier access to the cockpit. A bulkhead having pleated doors is located at Station 188, at the main spar, to separate the cabin from the cockpit. All cabin windows are tinted double-thickness to reduce noise levels.

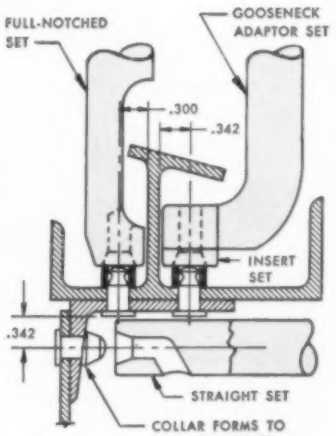
The cockpit has a wrap-around bird-proof glass windshield 275 sq. in. larger in area than the standard Lodestar configuration.

Redesigned control pedestal allows more foot room for easier entry and greater accessibility to the aircraft's controls.

Pedestal includes: autopilot control head with approach coupler and altitude controller; visual autopilot trim indicator; carburetor air and oil cooler door control switches and position indicator; electric propeller control and switches; supercharger control switches and indicator lights; throttles, mixture, landing gear, and wing flap controls;

HERE'S A TOUGH PROBLEM OF ACCESSIBILITY

for some fasteners but easily licked with HI-SHEARS!



Above minimum layout dimensions are for ¼" diameter Hi-Shear rivet.

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An automatically regulated Scott constant-flow oxygen system has outlets at each passenger and crew station.

Wing and Tail Changes

Revision of the flap calls for deletions of the track extensions. (The prototype shown in the photo still had parts of the guides, but these have been removed.) Relocation in the wing trailing edge of the pulleys permitted a completely flush installation. Flap travel is limited to 60%. Minnesota Airmotive states that travel beyond this generally has been found ineffective by pilots and seldom was used.

The outer wingtips are removed; an additional 105-gal capacity tank is installed in each outer panel. Tanks are adjacent to the external tip tanks and they are interconnected. The tip tanks hold 85 gal. each. The original 644-gal. inboard tanks are retained. A dual fuel system makes all tanks selective to either engine.

The constant-reading Minneapolis-Honeywell fuel quantity gages are installed for all six tanks. A flush-mounted retractable fuel dump chute is mounted in the belly. Fuel dumps also are provided for the outboard wing tanks.

Minnesota Airmotive has raised the angle of incidence of the horizontal stabilizer to eliminate the need for down-elevator at high speed. Increases in speed as a result of constant modification cause the Lodestar to porpoise at high speeds when the original configuration is retained.

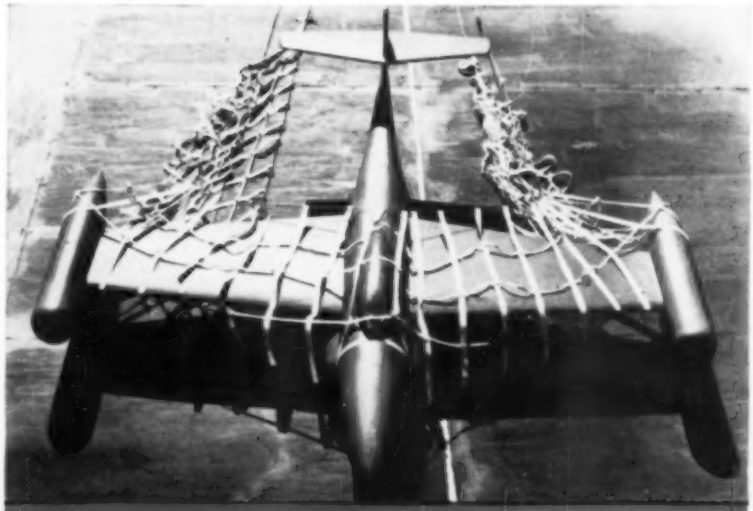
The powerplants use zero-time overhauled Hamilton Standard 33D50 propellers with square-tipped 6511A-12 blades, designed to improve engine cooling and give better climbing characteristics.

The prop governors are of double capacity with electrically operated control heads. Three-zone Edison fire detection systems of the thermal overheat type have 21 sensing units in each engine nacelle.

Landing Gear Layout

The landing gear has been modified to use Goodyear 12.5 x 16 wheels and Goodyear single-disk three-spot brakes. The strut fairings each have two flush-mounted landing lights. The tail wheel is completely retractable. Main landing gear is covered by retractable doors. There is an emergency tail wheel exten-

ENGINEERS
for absorbing problems



Airfield emergency overrun barriers for USAF are tested at AAE Georgetown facility on dynamic scale model airplanes

For over 16 years, All American Engineering has specialized in the service of taking on tough engineering assignments for the aviation industry and the military. Knotty problems in the field of energy absorption – like those involved in the arresting gear project shown here – have become a speciality.

Engineers are needed now. Because All American offers a complete engineering and development service, work assignments are rarely routine. They concern really challenging engineering problems. In the past these have ranged over energy absorption devices, seat ejection trainers, air pick up equipment and various types of air-borne winches. Investigate for yourself the opportunities at All American.

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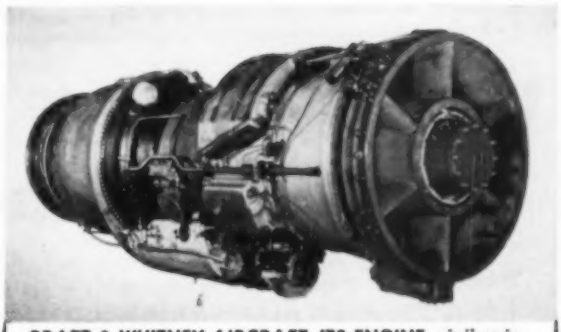
Turbojet engines designed, developed, and produced by Pratt & Whitney Aircraft will power both the Douglas DC-8s and the Boeing 707s. These are the JT3, commercial version of the powerful J-57, or the even more advanced JT4. Both are of twin-spool, axial flow design which provides high thrust coupled with outstanding fuel economy.

The new Douglas and Boeing jet transports will give the United States undisputed leadership in jet air travel. No aircraft in sight challenges them for speed, passenger capacity, and range.

Throughout the history of aviation, Pratt & Whitney Aircraft engines have led the field. Now the Pratt & Whitney turbojet engines join the distinguished company of the Wasp, the Twin Wasp, the Double Wasp, and the Wasp Major, helping the U. S. aviation industry continue its world leadership.



PRATT & WHITNEY AIRCRAFT JT3 ENGINE, civil aviation's version of the widely-used military J-57, most powerful jet engine now in quantity production.

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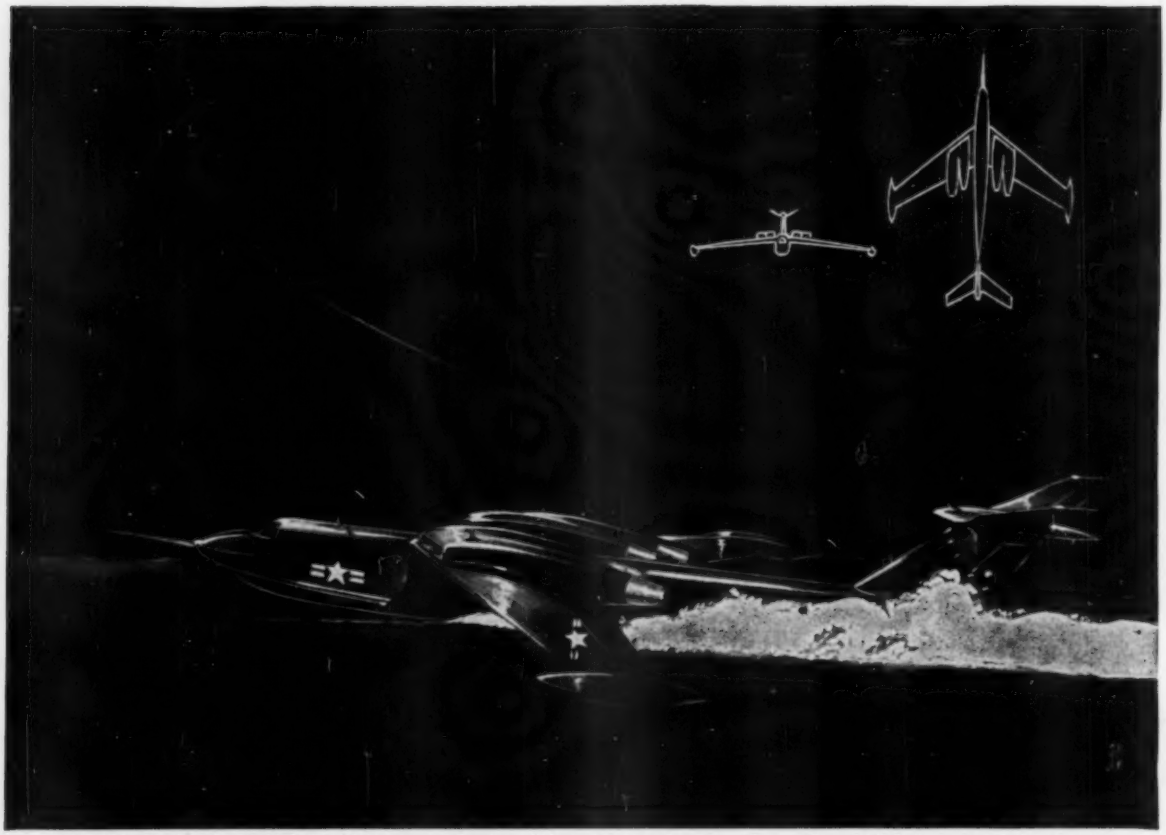

The U. S. Navy's XP6M SeaMaster was developed by Martin, Baltimore, for minelaying and photo-reconnaissance. But with 600 mph speed and global range, she's capable of carrying the most potent weapons on strategic missions.

World's first multi-jet attack seaplane

The SeaMaster crouches like a sprinter ready to spring. Then, powered by four J-71 jets, she rushes forward and skims off the waves.

The slender-hulled craft carries aloft a 30,000-pound payload. Carries it *fast*. She's the world's first multi-jet attack seaplane—and is the pioneer of a mobile seaplane striking force for the U. S. Navy.

Like many *land-based* multi-jets, the SeaMaster depends on Inco Nickel and Inco Nickel Alloys where service conditions are unusually severe. *Particularly where special combinations of heat and corrosion resistance, strength, toughness, and ductility are required.*

Perhaps one of the Inco Nickel Alloys can solve a metal problem for you, too. Inco's Technical Service Section is ready to help you investigate. Write them, giving details.

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are marketed under the following trademarks:

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Monel
Lock wire
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Pure Nickel for electrical and electronic gear. Primary Nickel as alloying element in other materials. Inco Precision Castings in many different alloys

sion system using nitrogen action.

Minnesota Airmotive reports that it is doubling its present production area at Wold Chamberlain Field, Minneapolis, to handle the conversion project in addition to other production increases.

The additional section will be housed in a new hangar adjacent to the present 36,000-sq. ft. facility.

National Sells Lodestars, Substitutes Convair 340's

National Airlines is gradually replacing its fleet of 11 Lockheed Lodestars with Convair 340s on routes previously served by the Lockheeds. The airline had converted some of the Lodestars into executive transports and was chartering them to corporations. Conversion of the remaining planes to executive configuration will be made before disposal.

Three of the Lodestars are being offered by William C. Wold Associates, New York multi-engine aircraft broker.

PRIVATE LINES

Expanded "wet-wing" tanks on Union Oil Co.'s Convair 340 business transport provide approximately 380 gal. additional fuel, increasing its range by some 600 mi. All fuel is kept outboard of the engine nacelles. Modification was handled by Pacific Airmotive Corp., and Aircraft Tank Service, Inc., Burbank, Calif.

Extensively modified Convair L-13 is being built by Longren Aircraft Co., Torrance, Calif. Company has received Civil Aeronautics Administration certification on Part 03 of the Civil Air Regulation covering this model. It is possible that production may be handled in Mexico.

Chemical weed control circular is available to aerial applicators from North Dakota Aeronautics Commission Extension Service, Fargo. Ask for Bulletin A-253.

A 140-mi. aerial photo survey will help re-locate U.S. Route 60, Interstate Route 3, W. Va. The state road commission has recently assigned the project to Aero Service Corp., Philadelphia, Pa.

Royal Gull amphibian will be sold in Ontario, Canada, by Field Aviation Co., Ltd., Oshawa. Dealership was granted by Timmins Aviation, Ltd., Montreal, Royal Gull Canadian distributor.

Key to Aviation Weather Forecasts explains weather symbols on card ap-

NORTH AMERICAN'S Columbus Division

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North American's Columbus Division has prime responsibility for the design, development and production of North American's Naval airplanes. The Division is young, with the highly-successful FJ-4, a "concept-to-flight" Columbus Division product, as evidence that its engineering team is "going places."

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Only one thing. Will the labor market keep pace?

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proximately 4-in. x 8½ in. Quantities of up to 25 are available from: U.S. Department of Commerce, Weather Bureau, Washington 25, D. C.

Ohio's highway patrol department acquired a Cessna 182 for search-and-rescue, manhunts, disaster aid, traffic control and similar duties.

New index to safety publications is available from Civil Aeronautics Administration. Ask for Aviation Safety Release No. 404.

Transistorized intercom for instructor-student use in light aircraft has battery good for 100 hr. Printed circuitry is also used. Trade named "Plane-Talk," the unit is made by Goldak Co., Inc., 1544 W. Glenoaks Blvd., Glendale 1, Calif.

A Westland Whirlwind (S-55) helicopter is being delivered to King Saud Bin Abdul Aziz, Saudi Arabia, for use on private hunting trips. The dual-control eight-passenger aircraft will be maintained by Saudi Arabian Airlines.

Tufts-Edgcumbe, Inc., Piper distributor, is moving to a 216-acre airport near Elgin, Ill., from its main base near Elmhurst, which is being closed down the end of this year due to expansion of private dwelling construction. The distributor expects to spend $100,000 improving the new location.

New de Havilland Heron four-engine executive transport is in the U.S. to explore sales market. It differs from earlier models in having full-feathering props, also increased fuel capacity totaling 500 U.S. gal., sufficient for 10 hr. endurance. Fully equipped, except for radio, it sells for about $230,000. Plane is being demonstrated by DH's U.S. representative I. S. Fossett, Marine Air Terminal, LaGuardia Airport, N. Y.

Carma Weejet primary trainer crashed near Tucson, Ariz., after the Air Force pilot parachuted during a spin. Designed primarily to compete for Navy orders with the Beech 73 Jet Mentor and Temco 51, the Continental J69-powered Weejet (AW Apr. 2, 27) had been clocked at 310 mph. at 13,000 ft. and dived at 476 mph. Carma Manufacturing Co., Torrance, Calif., plans to build another prototype.

Landing roll can be reduced greatly with proper use of flaps and elevators after touchdown, National Advisory Committee for Aeronautics points out. You can reduce stopping distance on wet concrete 10% by raising elevators immediately after the nosewheel touches down. Immediate flap retraction provides up to 25% less roll on dry con-

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and related professional fields of Stress, Weights and Balances, Tool Engineers, Chemical Processes, Thermodynamics

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Industrial Relations Manager
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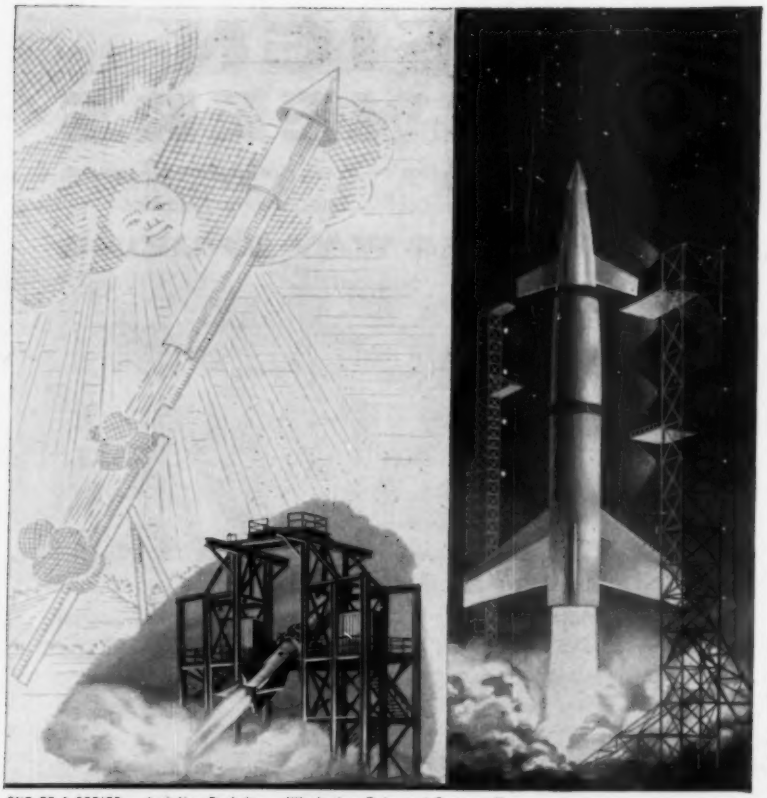

ONE OF A SERIES — depicting Rocketry — "Yesterday, Today and Tomorrow"

from the tartar wall to the moon

The Battle of Kai-fung-fu in 1232 . . . Ft. McHenry in 1814 . . . Goddard's experiments in 1920 . . the supersonic Bell X-1 in 1947 . . . these were milestones in rocketry. Slowly evolving into today's potent weapon, the rocket is still more than a weapon . . . it is man's escape route into space.

Before this frontier can be achieved, tremendously complex problems must be solved. Intriguing problems that challenge the ingenuity of even the most creative engineer. These problems are being solved every day by Bell Aircraft's engineering teams.

Bell's rocket engine division has designed and built numerous successful rocket engines for different Army, Navy and Air Force projects, including the Nike and Rascal guided missiles. In a continuing research program complete facilities are available, including 44 test cells capable of conducting over 400 test runs a month.

For the imaginative engineer with a sincere interest in his professional future and a wide choice in career opportunities, contact . . .

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BELL Aircraft CORPORATION

DEPT. 20E P. O. BOX 1 • BUFFALO, N. Y.

crete, 25% if it's wet. Flaps have little effect if it's icy.

Airwork's Arlington (Va.) branch moved to 5821 Seminary Rd., Bailey's Crossroad, Alexandria, Va. New phone: JEfferson 3-8118.

Map showing typical DME coverage at 6,000 ft. altitude and location of ground distance measuring equipment facilities is available gratis from General Aircraft Supply Corp., Detroit City Airport, Detroit 13, Mich.

Full-time airport consultant is on the staff of Aircraft Owners & Pilots Assn., Washington, D. C., as part of AOPA's intensified program to increase small airport and landing area facilities. Airport member is Cyril C. Thompson, who had been working part-time for the organization since last August.

Major event for corporate pilots will be Reading Aviation Service's 7th Annual maintenance and operations meeting June 2 at Reading (Pa.) Municipal Airport. Highlights will include presentations of $6,000 in cash prizes and trophies to outstanding business aircraft on the basis of appearance and equipment, and a static display of new products. More than 1,000 pilots and guests attended last year's sessions.

American Cynamid Co., N. Y., is getting a Learstar Mk. 1 business transport with the new 1,425-hp. Wright 987C9HD1 (R1820-86) engines, recently released for civilian applications.

New Lear distributor: Dixie Air, Inc., Tuscaloosa, Ala., installation and service of radio navigation and communications equipment, gyro instruments and autopilots, and flight control systems and accessories.

First production Safeather, providing automatic and certain indication of powerplant failure for multi-engine planes, has been installed in Twin-Beech executive transport of Champion Paper & Fibre Co., Houston, Tex.

Aeromatic aircraft propeller inventory and manufacturing rights have been purchased from Koppers Co., Inc., by Universal Aircraft Industries, Denver, Colo. Universal states that it will produce the propellers soon.

Locked brake and sudden wind gusts are reported to be causes of accident to Cessna 180 belonging to Capt. Jimmy Angel at David, Panama. The well-known jungle pilot was hospitalized at Gorgas Hospital as a result of injuries occurred when plane turned over, shifting heavy exploration equipment onto him.

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A Douglas engineer lives here

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They can...if you start your Douglas career now!

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Douglas has the reputation of being an "engineer's outfit," with the three top administrative posts being held by engineers. Maybe that's why it's the biggest, most successful unit in its field. Certainly it offers the engineer unexcelled opportunities in the specialty of *his* choice ...be it related to missiles or commercial or military aircraft.

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For further information about opportunities with Douglas in Santa Monica, El Segundo and Long Beach, California and Tulsa, Oklahoma, write today to:

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The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

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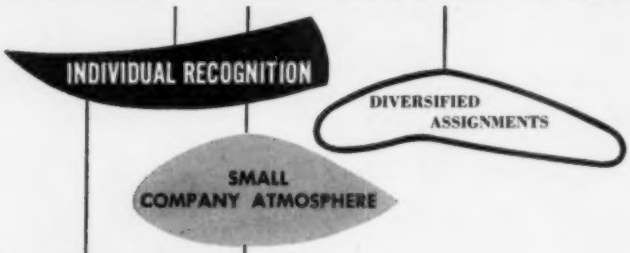
Send NEW ADS to Classified Advertising Div. of AVIATION WEEK, 330 W. 42nd St., N. Y. 36, N. Y.



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At General Electric's ANP Department esprit de corps is part of the work-environment. This is because the application of nuclear power for aircraft propulsion offers the qualified engineer the opportunities for personal achievement that go with professional challenge.

A responsible position is now open for an engineer interested in this field: must have an engineering degree, several years diversified experience in analysis and design of power plant components, including design of nuclear reactors. The job carries the responsibility for preliminary design analysis of power plants, and directing completed scale design and layout drawings of power plants and equipment.

Publication of research results in the appropriate classified or open literature is encouraged.

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Servomechanisms Inc. Western Division, manufacturers of electronic components & sub-systems is expanding its liaison staff.

Challenging positions are now open to men with electronic engineering background and technical sales experience. Military aviation experience (Pilots-engineers) helpful and will be considered.

Attractive Salary & expense arrangements.

All replies will be held in confidence.

Please send resume to Philip Earl

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☐ So you can better "tailor make" your offer to me I have attached a resume of my education and/or work experience.

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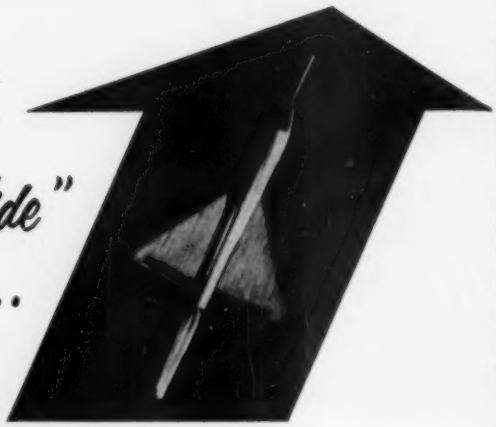
ENGINEERS



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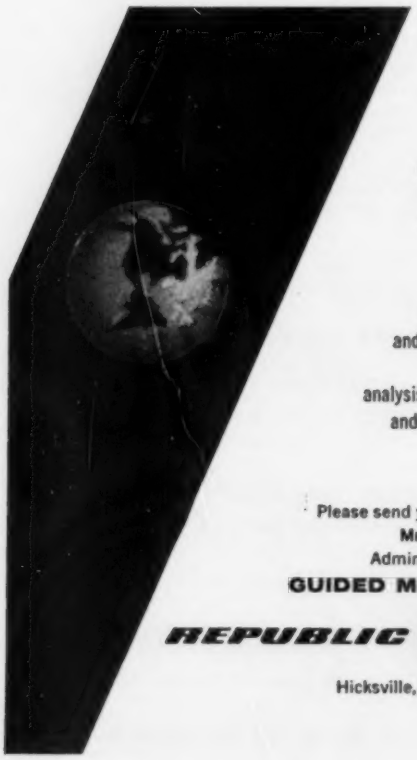

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Men with experience in stability and control, trajectory computation, wind tunnel testing, air load analysis, skin temperature computation, and aerodynamics heating problems.

Please send your complete resume to
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Aeronautical - Mechanical
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Salary will be commensurate with background and experience. All replies treated confidentially.

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McDONNELL Aircraft Corporation

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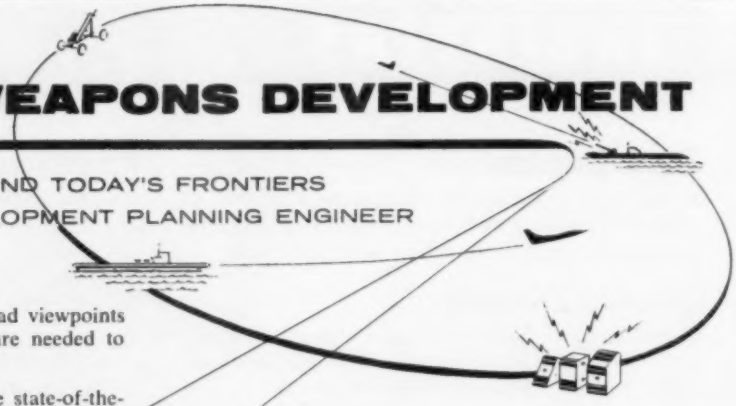

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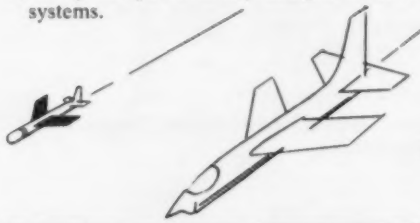

To arrange for a personal interview and a confidential evaluation of your qualifications send a resume of your background to:
Mr. John M. Sloan, Engineering Personnel

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Engineer

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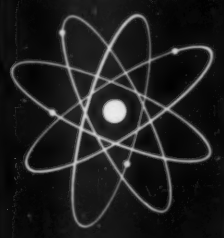

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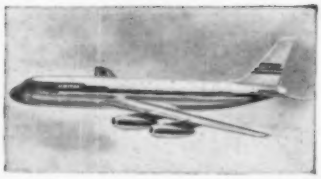

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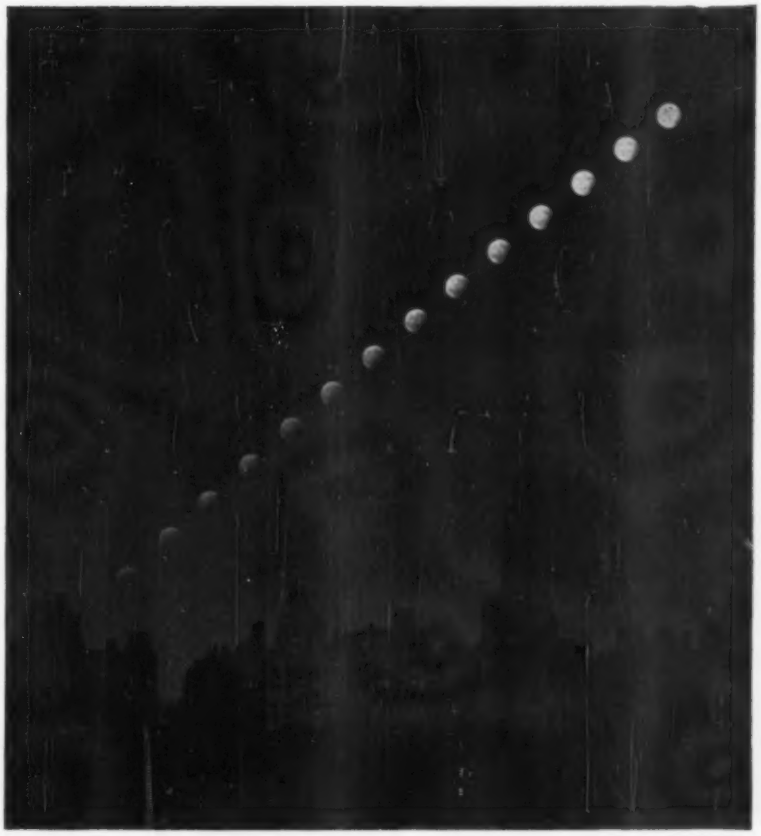

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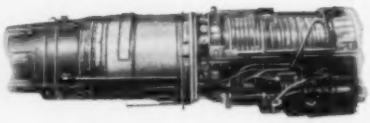

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Agency—Gaynor, Colman, Prentis & Varley, Inc.
ALLISON DIV., GENERAL MOTORS CORP. ..... Fourth Cover
Agency—Kudner Agency, Inc.
AMERICAN MACHINE & FOUNDRY COMPANY 81
Agency—Fletcher D. Richards, Inc.
ARMA DIVISION, AMERICAN BOSCH ARMA CORP. 52
Agency—Doyle, Kitchen & McCormick, Inc.
AUTONETICS, A DIV. OF NORTH AMERICAN AVIATION, INC. 93
Agency—Batten, Barton, Durstine & Osborn, Inc.
AVIATION WEEK 102, 103
BARRY CONTROLS, INCORPORATED 61
Agency—Engineered Advertising
BELL AIRCRAFT CORP. 114
Agency—Comstock & Co.
BENDIX RADIO DIV., BENDIX AVIATION CORP. 4
Agency—MacManus, John & Adams, Inc.
BRIDGEPORT BRASS COMPANY (ALUMINUM DIV.) 12
Agency—Hazard Advertising Company, Inc.
BURROUGHS CORPORATION 70
Agency—Campbell-Ewald Company
CELCO CONSTANTINE ENGINEERING LABORATORIES 78
Agency—John Philips Ads.
CESSNA AIRCRAFT COMPANY 42
Agency—Gardner Advertising Co.
CHAMPION SPARK PLUG CO. 66, 67
Agency—J. Walter Thompson Co.
CHANDLER-EVANS COMPANY 50
Agency—Hugh H. Graham & Associates, Inc.
COLE ELECTRIC COMPANY 69
Agency—Taggart & Young, Inc.
DARNELL CORP., LTD. 88
Agency—Henry L. Rhea Advertising
DOUGLAS AIRCRAFT CO., INC. 115
Agency—J. Walter Thompson Co.
EDISON, INC., THOMAS A. (INSTRUMENT DIV.) 104
Agency—Gaynor, Colman, Prentis & Varley, Inc.
ELASTIC STOP NUT CORP. OF AMERICA 68
Agency—G. M. Basford Company
ESSO STANDARD OIL CO. 10
Agency—McCann-Erickson, Inc.
FAFNIR BEARING CO., THE 22
Agency—Horton-Noyes Co.
FAIRCHILD ENGINE & AIRPLANE CORP. 36, 78
Agency—Gaynor, Colman, Prentis & Varley, Inc.
FASTENERS, INC. 55
Agency—Doyle, Kitchen & McCormick, Inc.
FINN & CO., INC. T. R., ELECTRONICS DIV. 86
Agency—Feeley Advertising Agency
FLIGHT RESEARCH, INC. 63
Agency—D. C. Smith, Inc.
GARRETT CORP., THE (AVIATION SERVICE CO.) 54
Agency—J. Walter Thompson Co.
GENERAL ELECTRIC COMPANY 16, 72, 73, 87, 129
Agency—G. M. Basford Company
GOODYEAR AIRCRAFT CORP. 3
Agency—Kudner Agency, Inc.
GYRO DYNAMICS, A DIV. OF DARCO INDUSTRIES, INC. 84
Agency—Pacific Western Adv. Agency, Inc.
HARVEY ALUMINUM DIV. OF HARVEY MACHINE CO., INC. ..... Third Cover
Agency—Hixson & Jorgensen, Inc.
HAYES AIRCRAFT CORPORATION 88
Agency—Sifuo & Dorne Co., Inc.
HI-SHEAR RIVET TOOL COMPANY, THE 105
HOOVER ELECTRIC CO. 11
Agency—The Martin R. Klitten Co., Inc.
INTERNATIONAL NICKEL CO., INC., THE 110
Agency—Marschalk & Pratt Div. of McCann-Erickson Inc.
INTERSTATE ENGINEERING CORP. 62
Agency—Wade Adv. Agency Inc.
KAISER METAL PRODUCTS INC. 81
Agency—Lincoln Roden Adv.
KAYNAR COMPANY, THE KAYLOCK DIV. ..... Second Cover
Agency—J. M. Straus & Co.
LAMINATED SHIM CO. INC. 5
Agency—Wilson, Haight, Welch & Grover Inc.
LE TOURNEAU INC. R. G. 53
Agency—Evans & Association
LOCKHEED AIRCRAFT CORP. (MISSILE SYSTEMS DIV.) 82, 83
Agency—Foote, Cone & Belding
LOCKHEED AIRCRAFT CORP. 74
Agency—Donahue & Coe, Inc.
MARQUARDT AIRCRAFT COMPANY 89, 96
Agency—Heintz & Co., Inc.
MAXSON CORP., THE W. L. 60
Agency—Engineered Advertising
MINNEAPOLIS-HONEYWELL REGULATOR CO (AERONAUTICAL DIV.) 97
Agency—Foote, Cone & Belding
MORRIS BEAN & COMPANY 76
Agency—Odiorne Industrial Adv.
NEMS-CLARKE, INC. 93
Agency—John E. Waterfield Admasters Adv., Inc.
NORDEN-KETAY CORP. (INSTRUMENT & SYSTEMS DIV.) 77
Agency—Hicks & Greist, Inc.
NORTH AMERICAN AVIATION, INC. (COLUMBUS DIV.) 111
Agency—Batten, Barton, Durstine & Osborn, Inc.
OHIO SEAMLESS TUBE DIV. OF COPPERWELD STEEL COMPANY 8
Agency—Howard Swink Adv. Agency, Inc.
PRATT & WHITNEY AIRCRAFT DIV., UNITED AIRCRAFT CORP. 108, 109
Agency—Lennen & Newell, Inc.
RAYMOND ROSEN ENGINEERING PRODUCTS, INC. 98
Agency—Al Paul Lefton Co., Inc.
REVERE CORP. OF AMERICA 80
Agency—W. L. Towne Advertising
RHEEM MFG. COMPANY, GOVT. PRODUCTS DIV. 35
Agency—Campbell-Ewald Co.
ROBINSON CO., RALPH C. 96
Agency—Chapin-Damm Adv.
ROHM & HAAS CO. 6
Agency—Arndt, Preston, Chapin, Lamb & Keen, Inc.
ROHR AIRCRAFT CORPORATION 113
Agency—Barnes Chase Company
SCHULZ TOOL & MFG. CO. 20
SCIAKY BROS., INC. 9
Agency—Russell T. Gray, Inc.
SCINTILLA DIV., BENDIX AVIATION CORP. 14
Agency—MacManus, John & Adams, Inc.
SEARCHLIGHT SECTION 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128
SERVICE STEEL DIV. VAN PELT CORP. 87
Agency—Claude E. Whipple Adv.
SOLAR AIRCRAFT COMPANY 90
Agency—The Phillips-Ramsey Co. Adv.
SPENCER THERMOSTAT DIV., METALS & CONTROLS CORP. 79
Agency—Sutherland-Abbott Adv.
SPERRY GYROSCOPE CO., DIV. OF SPERRY RAND CORP. 48, 49
Agency—Reach, Yates & Mattoon, Inc.
SUMNERS GYROSCOPE COMPANY 24
Agency—Byron R. Brown & Staff, Inc.
SURFACE COMBUSTION CORP. (JANITROL AIRCRAFT-AUTOMOTIVE DIV.) 13
Agency—Odiorne Industrial Adv.
SUTORBILT CORPORATION 96
TOWNSEND COMPANY (CHERRY RIVET DIV.) 94, 95
Agency—Bond & Starr, Inc.
TWIN COACH CO., AIRCRAFT DIV. 58
Agency—Palm & Patterson, Inc.
VICKERS, INC., DIV. OF SPERRY RAND CORP. 106
Agency—Witte & Burden Adv.
WESTINGHOUSE ELECTRIC CORP. 92
Agency—H. W. Buddemeir Co.
WHITTAKER CO., LTD., W. R. 17
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ZENITH AIRCRAFT CO., DIV. OF ZENITH PLASTICS 18
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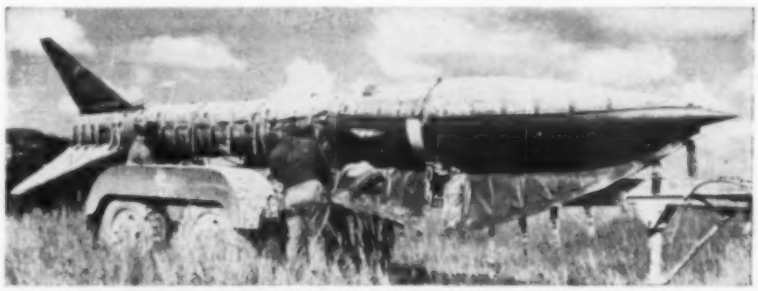
EMPLOYMENT OPPORTUNITIES 116-126
SPECIAL SERVICES TO THE INDUSTRY 126
EDUCATIONAL
Schools 127
PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 127-128
WANTED
Planes—Equipment 128



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LETTERS

Stands by Electra

The following paragraph appears on page 99 of your April 9 issue in the story about the Convair Skylark:

"News of the Convair jet was followed closely by proposals of similar planes by Boeing, Douglas and Lockheed."

We should like to state that several medium-range jet transport design studies have long been on our drawing boards—as part of our continuing study of all transport possibilities.

But we have not proposed to build one.

Lockheed's new project Electra stands first in our favor as the ideal medium-range transport. Since its emergence as a design-competition winner some months ago, it has been started into full production for several major airlines. We expect many more sales.

P. K. Yost, Jr.
Director, Commercial Sales
Lockheed Aircraft Corporation
Burbank, California

Advice to Stelbasky

As regards your "Willing Draftsman" (AW May 14, p. 154), Mr. Stelbasky, let me advise him that I have no college degree either.

However, during the past five or six years I have tactfully applied myself, and have held the following successively expansive jobs in various engineering organizations: draftsman, expediter-correspondent, parts cataloguer, description pattern writer and engineering technical writer.

I now find myself responsible for the systems analyzation and engineering writing of complete instruction manuals (TM's) on guided missile systems, as well as associated tool designing.

All this from humble beginnings.

Mr. Stelbasky would do well to conduct an "agonizing reappraisal" of his abilities. I think they are far greater and potentially more lucrative than he imagines them to be.

Let him consider employment with a parts cataloguing organization or department, for which I know he is now well qualified. From such a position of strength, he may branch out into the more advanced work requirements of the technical writer, systems analyst, tool designer, etc.

Incidentally, I have studied flying in my spare time. Now I possess a Commercial Pilot's license and current Instrument Rating, and hope to obtain an initial co-pilot position. Perhaps I can become a valuable man in aviation some day.

Lugubriousness will profit Mr. Stelbasky nought in this business.

Arnold J. Friedman
Western Electric Company, Inc.
Chatham Road
Winston-Salem, N. C.

Why Not Army Air?

This letter is not being written to detract from the achievements of the U. S. Air Force in the field of assault aircraft operation. The intent is, with reference to the C-123 article (AW April 9, p. 28), to ask why the Air Force instead of the Army is involved in this sphere of military aviation.

Comments prompted by this article are:

(1) Why a "USAF bus for Army GI," as the caption for one photo reads? Why not an Army bus for Army GIs—operated by Army personnel? On an Air Force base one does not see Army buses or trucks operated by Army drivers transporting Air Force personnel or supplies. So why the present concept, favored by the Air Force, of limiting the Army to the medium of surface transportation?

(2) As evidenced by one photo illustrating the C-123 article, there were five mechanics engaged in maintenance on one C-123. This maintenance effort could well be utilized in those F-100 squadrons which have one-third of their aircraft grounded for the lack of maintenance personnel.

(3) Were the Army operating its own assault and cargo aircraft it would eliminate the fretting of Air Force personnel about the absence of center of gravity marking and/or incomplete weight data on vehicles and equipment to be air transported since these shortcomings would be remedied by the user (the Army) in the normal course of operations.

(4) The degree of "unpreparedness" of the air strips illustrated in the C-123 article is not very impressive—unless a thin layer of dust on a smooth, even landing surface renders that air strip "unprepared."

In conclusion I maintain that a top-level reappraisal of policies governing aircraft employment by the military services is long overdue and that the defense by Air Force partisans of the Air Force as an end instead of as a means should cease.

Artillery Captain

Prone Pilots

The article in the April 2nd issue of Aviation Week concerning the British prone cockpit installation reminded me of the similar project we performed in 1949-50. You will recall your own article describing this modification of an F-80 to install the prone pilot bed and controls developed by Mr. H. T. E. Hertzberg of the Aero Medical Laboratory at WADC. In checking over some old files, I have come to the conclusion that your article appeared in a late December 1952 or early January 1953 issue. (AW Dec. 29, 1952, p. 21—*Ed.*)

Judging from the photograph of the British bed, the USAF development was quite superior with respect to weight, neatness and comfort. Apparently the British version lacked the forearm support provided by the USAF control system and thus caused the "elbow fatigue after one hour." Also, I would judge that the breathlessness caused by low altitude turbulence in the British tests was a result of the rather rigid body supporting structure; you will remember that USAF bed consisted of nylon netting stretched between two contoured side rails, and the nylon netting's elasticity alleviated this problem to an extent that we never noticed such discomfort in our own flight tests. Also, the adjustable and swiveling chin rest support in the USAF bed would seem to be inherently capable of furnishing more comfort than the British design.

Despite these superiorities of Ed Hertzberg's design, the major drawbacks of the prone position remain, namely, inadequate upward and rearward vision, and the difficulty in providing accessibility to controls, instruments, maps, and so forth. It is a shame that the British were unaware of our work in this country because it apparently antedated their own, and obviously could have saved them much time and expense. Incidentally, it was amusing to find that the British had the usual fallacious idea concerning the advantages of the prone position with respect to frontal area. To illustrate this, draw yourself a typical idealized air foil shape, such as a laminar-flow wing cross-section. Within this envelope, sketch in the profile of a man seated conventionally, then sketch him in the semi-prone position, then in the supine position. You will very quickly discover that there is far less protuberance beyond contour with the supine position, and even the conventional position is preferable to the prone.

R. H. Frost, Vice President
Stanley Aviation Corporation
2500 Dallas Street Denver 8, Colorado

Emerson's Honest John

I would like to call your attention to an error in the March 12, 1956 issue of Aviation Week in which you list Douglas Aircraft as the manufacturer of the Little John missile.

The Electronics and Avionics Division of The Emerson Electric Manufacturing Company was awarded a contract for the development of the Little John missile some time ago. I would also like to advise you that we have been manufacturing the Honest John missile for several years and are still continuing as a supplier to the U. S. Army for this item.

I would appreciate your correcting the information in the March 12 issue of Aviation Week to indicate the Electronics and Avionics Division of Emerson as the development source for the Little John missile.

C. G. Gulledge, Assistant Vice-President
Electronics and Avionics Division
Emerson Electric Manufacturing Co.
8100 Florissant Ave., St. Louis 21, Mo.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

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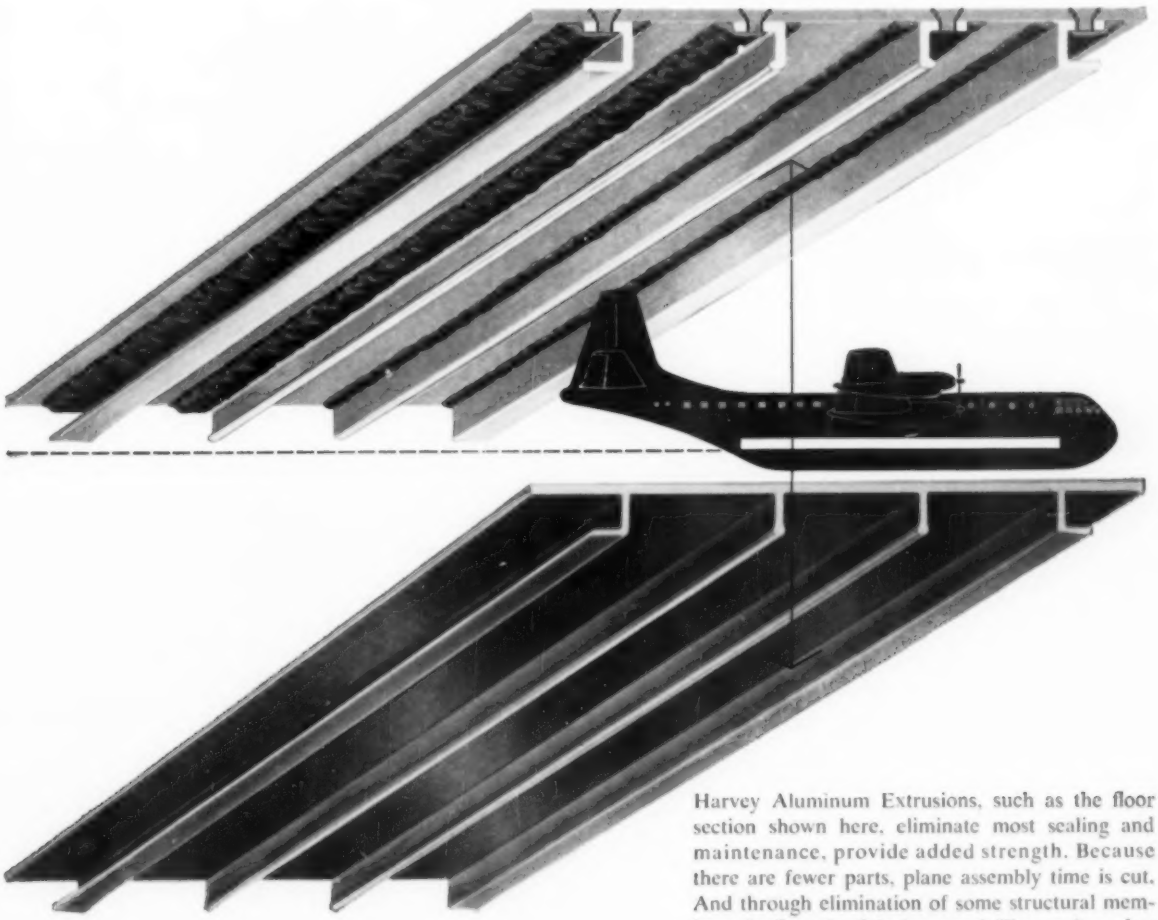

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Six of these versatile McDonnell fighters, powered by the Allison J71 engine, were put through an accelerated flight and maintenance program by Naval aviators and maintenance personnel brought in from various Fleet squadrons.

The program—successfully completed more than a full week ahead of schedule—involved over 600 hours of intensive test flying under simulated combat conditions. It included catapult launchings, simulated carrier landings, night instrument flying, night intercepts, night formation flying and a full range of tactical maneuvers typical of combat fleet operation at all altitudes from sea level to very high altitudes.

By successful completion of this exhaustive test program in record time, the F3H Demon and Allison J71 clearly demonstrated the qualities of reliability and dependability required of all new equipment before entering fleet service. Already established as the fastest all-weather Navy fighter now in service, the Allison-powered Demon thus becomes a valued and respected addition to the air arm of the U.S. Fleet.

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